THE OLD TIMER'S BULLETIN

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WHOM TO CONTACT

Please write legibly. Enclosing an SASE speeds replies.

Dues and address changes: Joyce Peckham (Secretary), Box E, Breesport, NY 14816, (607) 739-5443. Dues: 1 year, $12; 2 years, $22; 3 years, $33; overseas (airmail), $15. Make check payable to AWA.

Bulletin material; news of non-joint meets; orders for the AWA Review or OTB back issues: Ludwell Sibley (Editor), 44 E. Main St., Flemington, NJ 08822-1224, (908) 782-4894. **(Exception: column material should go to column editors.)**

Want ads, coordination of joint meets and slide/video shows: Richard Ransley (First Vice President), Box 41, Sodus, NY 14551.

Museum operation: Bruce Kelley (Curator), 59 Main St., Bloomfield, NY 14469.

AWA official business: Bruce Roloson (President), 2577 Rittmer Ln., Seneca Falls, NY 13418.

Annual conference business: William Fizette (Second Vice President), RD 1, Box 55, Henryville, PA 18332.

Financial reports: Dexter Deeley (Treasurer), 8 Briar Circle, Rochester, NY 14618.

AWA NETS (EST)

PHONE:

Sun. 7247 kHz SSB, noon (NCS: N4FS)
3837 kHz, QRP & AM, 5 PM, Nov. thru April (NCSs: W2ICE & AA2CU)
Tues. 14274 kHz SSB, 2:30 PM (NCSs: KC3YE & W0FXY)
3837 kHz SSB, 8 PM (NCS N4FS)
Mon.-Wed.-Fri. 3867 kHz, 9:30 AM (NCSs: W2ICE & W2SHN)

CW:

Daily, 4 PM, 7050 kHz (NCS varies)
First Wed. of each month, 8 PM, 7050

2-M REPEATER (Rochester area):
Mon., 7:30 PM (NCS: W2ICE)
Receive 146.820 MHz; transmit 146.220

FROM THE SKUNK WORKS

Ludwell Sibley, KB2EVN, Editor

THIS ISSUE

Here we go with another *OTB*. In the "golden glow" phase of the Rochester conference, we also have the word on three other recent meets. This issue covers transistor sets "before there *were* transistor sets," military and commercial communications, a first-ever history of a radio maker in Poland, and a QRP transmitter that's just in time to build for February's Old-Time Contest.

AWA REVIEW 8

Yes, it's now available - see the handy order form enclosed with this issue. A jim-dandy Christmas present, by the way . . . or, better yet, give someone a Review and an AWA membership.

We're asking, via the same form, which of the "extinct" Reviews (1, 3, 4, or 5) readers would most like to see in a new printing.

TEN YEARS AFTER

It's hard to believe that, as of the start of 1994, it will have been 10 years since the Bell System was torn down. A pivotal event in communications history, in which - one could argue - a unified nationwide network was turned into a kluge. The stockholders came out OK, as did employees who got golden-parachute deals, but it seems that the nation is poorer. Time, and politics, march on.

AT&T's divestiture was a *radio* event too: it affected ownership (or existence) of several thousand microwave stations, as with coastal-harbor services and industry dispatch systems . . . plus the turmoil in the cellular industry as the new regional companies bought into each other's territory.

Bell loyalists aren't alone: a lot of ex-RCA employees ask the same "was it necessary?" question.

THE COVER

Ron Boucher's "Al's Radio Shop" cartoons have appeared in the *ARCA Gazette* and *Antique Radio Classified*. This third in the series gives a back-alley view of the shop as of April 1938, with the young man with the wagon sighting a stack of discarded trade-ins. (How would *you* like to be eyeing an abandoned Radiola IV or Grebe CR-5?)

Color prints of the three cartoons are available from the artist at PO Box 41, Goffstown, NH 03045, at $9.95 each plus $1 per order for shipping.

Cartoon copyright (c) 1993 Ron Boucher

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THE RADIO HISTORY YOU SAVE MAY BE YOUR OWN

THE ROCHESTER CONFERENCE - 1993

Ludwell Sibley, AWA Press Corps

Our conference for 1993 is now history (in more ways than one!) and a fine success. The Rochester event drew 860 registered guests, up from a final figure of 820 last year, giving - including spouses and friends - a thousand or so in attendance. Members came from far-away places: California, Hawaii, western Canada, Japan, Sweden, England, and so on. The central theme this year was "Westinghouse." Bill Fizette's management kept the schedule flowing smoothly.

PROGRAM

As organizer of the sessions, Lauren Peckham scheduled an enjoyable selection of programs. On Wednesday, Bart Lee, after a "squeaker" involving a cancelled flight, arrived just in time to run his "News for SWLs" session. The Key & Telegraph program chaired by Murray Willer featured some choice collectables and a talk by Roger Reinke on restoring telegraph gear, using as an example the Facer key in his column in this *OTB*.

On Thursday, Todd Prowell led a session on "DXing with the RC Receiver" featuring rare items from the 1922 Westinghouse RA-DA-RC line. John Terrey of *A. R. C.* led a well received session on collecting and preserving early books, with the aid of Frank Becquaert of Rainy Day Books and author-collector Alan Douglas. Lauren Peckham presented an innovative program, the "Radio Collector's Slide Show," with pictures of newsworthy items from the Frisbie, Jensby, Houston, Peckham, and Sibley collections. In the evening, the Pittsburgh Antique Radio Society presented "On the Air," an old-time 16-mm sound movie on Westinghouse station KDKA.

On Friday, Bruce Kelley organized the amateur-radio seminar covering the OT Contest, with winner W2ZM, and related matters. Bruce showed an old-time movie covering the laying of the first Atlantic telegraph cable.

Saturday morning began with Charlie Ruch presenting a talk on Frank Conrad, the early Westinghouse inventor, filling-in for Rick Harris. Then Parker Heinemann gave his session on the early history of Collins Radio. Bruce Kelley organized a bring-and-show session on pre-1910 electrical apparatus. It drew some fascinating entries: a Nernst lamp, a Telefunken coherer demonstration, an external-interrupter medical battery traceable to 1845 or so, an E. I. Co. electrolytic detector, a Phelps/Western Union ring-magnet telephone receiver ca. 1880, etc. Then Mike Adams closed the sessions by playing a preview of his upcoming video program on San Jose's pioneer broadcaster Charles Herrold.

EQUIPMENT CONTEST

Ralph Williams, organizer of this session, was absent due to work commitments, but Geoff Bourne filled-in smoothly. The quality and instructive value of the exhibits rises year-to-year. There is a lot of showmanship, too, with such working displays as one more of Peter Yanczer's disc-TV systems televising a classic Felix the Cat doll, Robert Lozier's Volksempfängers playing Nazi marching songs just as when new, Dave Abramson's mirror-in-the-lid receiver showing authentically foggy kinescope recordings of early TV programs, or Ross Smith's working/glowing mockup of the RA-DA on p. 20 of the last *OTB* delivering '20s music. Besides the ol' pros like Floyd Jury, it is gratifying to see new exhibitors like Stephen Brown or William Stokes with fine exhibits on their first appearances. The room probably contained every surviving Aeriola/Radiola Grand in the galaxy!

BANQUETS

The Friday contest-awards dinner featured Geoff Bourne announcing the winners and highlights of the contest, followed by Charlie Ruch with a novel biographical slide show on George Westinghouse. The main banquet on Saturday included Joseph Meagher of the Westinghouse-sponsored Historical Electronics Museum in Baltimore, with a slide tour of the radars and other electronic gear in his facility. (See the Aug. 1991 *OTB*, p. 55.)

The banquets included presentations of awards. They were as follows: **Thompson/Best of Show**: Stephen Brown, for his Radiola Grand exhibit; **Display**: Floyd Jury, for his WW I aircraft-wireless exhibit; **Matlack**: Mike Raide, for his HT-9 restoration; **Cundall**: Bob Raide, W2ZM, for winning the OT Contest; **BK-OTB**: Peter Yanczer, for his story on mechanical TV in the August issue; **Houck-Documentation**: Bill Holly, for his book on the Vibroplex Company; **Houck-Preservation**, Mike Feher, for his high-quality collection; **Tyne**: Edward Herold (posthumously), for his AWA Review 7 article on tube-development history; **President's**: Ludwell Sibley, for his *OTB*-Review services to the Association.

THE FLEA MARKET

This year's never-on-Tuesday plan was largely effective in directing trade to the nominal dates. Ed Gable gets credit for devising this plan and administering it. There were some problems of staffing, to be addressed next year, but the paved spaces sold out early and there were enough grass areas to handle late registrants. Weather was fine on Wednesday, a bit on the moist side Thursday,

(Continued on p. 50)

COMMUNICATIONS-EQUIPMENT AUCTION(S)

Ed Gable, K2MP, Auctioneer

Includes regular and estate material.

Abbott DK3 2½-m transceiver, fair 15
Central Electronics
- 20A exciter, good 15
- 20A exciter, modified ..... 40 (!)
- 458 VFO, VG 15

Collins
- 51J-2 receiver, w/book, VG 160
- 75A-1 receiver w/spkr, book, clean, VG 275
- 75A-1 and 270G-3 speaker, exc., w/book 175
- 75A-2 receiver, book,, clean 265

Echophone EC-1 rcvr (2) ..... good, 55; VG, 60
Echophone EC-2 rcvr, good 60
Eddystone 670A, bad paint, good otherwise 60
Eldico SSB-100 xmtr, clean 80
Gonset
- 10/11-meter mobile converter, good 5
- 3-30 mobile converter, fair 16
- Commander transmitter, VG 35

Hallicrafters
- DD-1 dual diversity, receiver unit only, w/book, fair-good 925
- HA-1 "TO" keyer, exc. 20
- HT-7 frequency standard, exc. 30
- HT-9 transmitter, VG 70
- HT-32 xmtr, book, crisp (2 sales) 60, 70
- R-42 "bass reflex" speaker, VG 50
- R-46A speaker, fair 15
- SX-12 and contemporary speaker, exc. 155
- SX-16 and unident. speaker, fair 80
- SX-16, good 85
- SX-18, fair 50
- S-19 (2) ..... poor, 20; fair, 35
- S-20R, fair (2) 10, 15
- SX-23, matching spkr, expertly relabeled, nice 385
- SX-24, poor 15
- SX-24 and PM-23 speaker, fair 25
- SX-25 and PM-23 speaker, exc. 60
- SX-25, book, clean 75
- S-27s (4), fair-good 15, 15, 15, 45
- SX-28s, most with book and speaker (4) 25, 25, 60, 65
- S-37, scruffy but complete 35
- S-38 (2) ..... grubby, 5; good, 35
- S-38C, fair 5
- S-38D, VG 18
- S-38E, parts set 2
- S-40, fair, with spare cabinet for restoration 40
- S-40 with Heathkit Q-mult., poor 15
- S-40A, scruffy 20
- S-40B, poor 15
- S-40B and SM-40 "S" meter, good 65
- SX-42s, most with R-42 speaker (5) 20, 40, 55, 60, 100
- SX-43 and R-44 speaker, fair 30
- S-55, fair 15
- SX-62(A)s, most w/book and R-46A spkr (5) 65, 65, 80, 85, 100
- SX-99, orig., vy clean 70
- SX-110, speaker, VG 40
- SX-101 and R-48 speaker, exc. 55
- SX-101A, less calibrator, VG 75
- SX-101A w/book, VG 110
- S-119, good 20

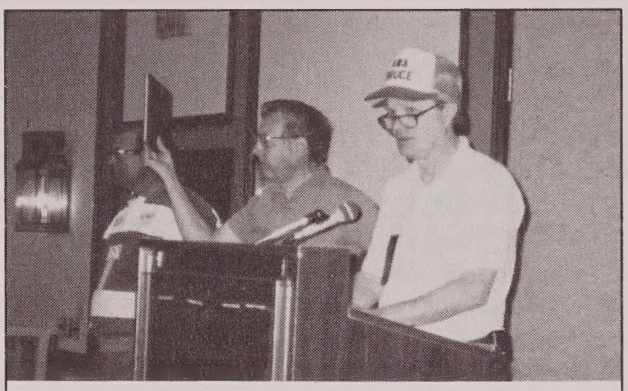
Hammarlund
- Comet Pro
  - With one coil pair and book, fair/good 50
  - With two coil pairs and book, good 70
  - With six coil pairs and book, good 130
  - Coils only, 5 mixed 30
- HQ-110 w/book, clean 100
- HQ-120, w/book and speaker, fair 50
- HQ-129X, with book ..... fair (2), 45, 50; good, 55; VG, 75; exc., 85
- HQ-140/140X, VG 60, 100
- Super-Pro (also see BC-779 below)
  - Type BJ (non-crystal model), w/PS, good 45
  - SP-200, scruffy 40
  - SP-600-JX-17, w/book, VG (2)
    - Less cabinet 160
    - In good cabinet 200

Harvey-Wells TBS-50D Bandmaster, rusty 25
Heathkit
- DX-60B xmtr, exc. 40
- DX-100, nonorig. final knob, book, handles added (?) 30
- MR-1 Commanche rcvr, w/PS 22
- QF-1 Q-multiplier, VG 5
- SB-400 xmtr, book, VG 100
- SB-series freq. display, VG 20

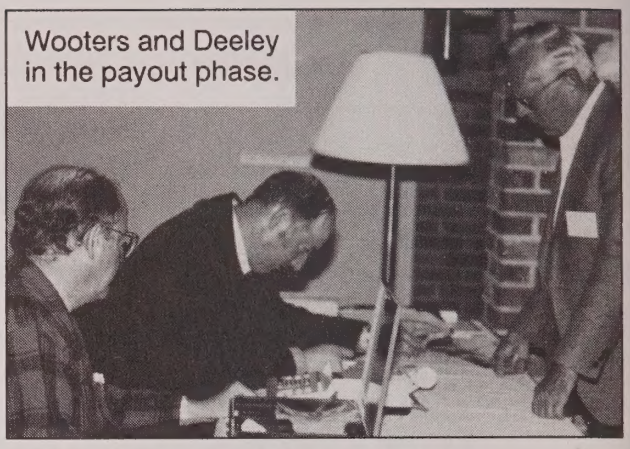
Homebuilt
- Two-tube receiver, National parts, good 30
- Three-tube receiver, ca. 1935 35
- "Meissner All Star," 2 sets coils 70

Howard 450, odd grille cloth, OK otherwise 45
Howard 460A, VG 185
ICOM 120A 2-m FM, xmit not working 15
Johnson
- Viking I, w/book, exc. 55
- Viking II, w/book ..... good, 35; VG, 40

Lysco exciter-xmtr, good 20
Mackay 128AY receiver, good 45
Meissner All-Wave 12, w/book, good 50
Military/Naval
- "ARC-5" package: dual rack, three receivers (1 orig. w/dynamotor, one heavily mod.), BC-451 control box 80
- "ARC-5" package: triple rack with 3 rcvrs, with



Gable, Peckham, and Roloson auctioneering.



Wooters and Deeley in the payout phase.

cranks & dyns., all modified 95
"ARC-5" package: 2 rcvrs (1 orig. w/dyn., 1 mod.); T-19/ARC-5 xmtr, heav. mod.; copy of Command Sets; GF/RU control box.. 120
BC-312s/342s, most with LS-3 speakers and copies of books (6) 20, 25, 35, 50, 65, 65
BC-348s, most with LS-3 speakers (4) 25, 25, 35, 50
BC-779/794/1004s, with PSs (4)... 40, 40, 40, 50
BC-1023 marker-beacon rcvr, NIB 20
Panadaptor, BC-1031/RBV (2) 40, 60
R-17A/FMQ-1 radiosonde rcvr (repackaged National 1-10), no coils, good 45
R-174/URR & PP-308 PS, bad paint, otherwise VG 60
R-274/FRR (Hallicrafters SX-73), book, VG ... 300
R-392/URR, VG 120
RAK-8, Magnavox-made, dirty but OK 20
RAO-7, good 40
RAS-5 coilsets (6) in case, VG 45
RBC-2, with PS, heavily mod. 10
RBL-2, w/book, poor 5
RBL-5s, w/book, VG-exc. (2) 40, 45
Millen 90700 VFO, good 70
Millen 90800 exciter, w/book, good 55
National
HFS w/coils, book, PS, exc. 80
HRO, 2.5-V model, lightly mod, VG, w/book, Coast Guard PS, and 4 coilsets having same S/N, in coil-storage box 85
HRO, 2.5-V model, w/book, four coilsets, dirty but sound 75
HRO, postwar, w/book, five coilsets, lightly mod., good 80
HRO-5RA1, with 697 PS and speaker, book, good, with four coilsets and storage box. 175
HRO-5TA1, table-style, 7 coilsets, 2 coil boxes, book, rack PS, rack spkr 200
HRO-50R1, lightly mod., VG, w/book, four coilsets in storage box 120
HRO-50T, very clean, w/book, 7 coilsets 130
HRO coilsets (5) and 42 loose coils 60
HRO-7 coilsets (6), good 50
NC-46, good 35
NC-57M, good 30
NC-100 and Heath Q-multiplier, good 50
NC-100A, disassembled into a kit 55
NC-100A, needs dial pointer, VG 140
NC-100ASD, w/book, poor 25
NC-100X, hole in panel, otherwise OK 55
NC-101XA, fair 75
NC-173, matching spkr, SOJ filt., book, VG ... 75
NC-173, w/book, nice inside, fair outside 40
NC-183 and SOJ filter, w/book, fair cond. 85
NC-2-40D, w/matching speaker, book, good.. 95
NC-2-40D, w/unident. speaker, w/book, fair 70
NC-300, cosmetically poor 55
NC-300, VG 70
SW-3 (ACSW-3), with four NIB coil pairs and two loose coils, exc., with PS and copy of book 400
SW-3, 2.5-V, w/one pair coils and home-built PS, copy of book, VG 180
SW-3, PS, 5 coil pairs, VG 300
SW-54, good (2) 5, 25
TRM 5-m rcvr, exc. 80
1-10, one pair coils, lightly mod., good 20
1-10A, all coil pairs, with PS, exc. 65
Parts, PW dial (2 boxes) 30, 40
Panoramic PCA-2-T200 panadapter, w/book, exc.. 60
Patterson PR-16, w/book, good 70
RCA
ACR-136, panel mod., nonmatching spkr 65
ACR-136, fair 110
AR-88 w/matching speaker, less tubes, fair .. 80
RME
DB-22A preselector, VG 90
DM-36 5-10 meter conv., VG 35
RME-45, fair-to-good 50
RME-45B rcvr & VHF-152 conv., clean 210
RME-99, poor 80
RME-4350, VG cond. 30
VHF-152A conv. w/RME IF-audio unit, VG. 20
126 50-144-220 MHz converter, exc. (2) ... 30, 40
Stancor 69 transmitter, fair 80
Telrad 18A frequency standard, VG 5
Unidentified "UHF" monitor, VG 5
Unidentifiede mid-'30s receiver, fair 10
WRL Globe Scout 65 xmtr, good 50
WRL Globe Champion modulator, good 15
Parts, receiver: S-meters (8); RAS noise lim.; Pilot Wasp coils (4) 40

TUBE AUCTION

Bruce Roloson, Auctioneer

"EL": Estate Lot; "NIB": New In box

AEG (German) K1 repeater tube, WW I, good fil. **360**
Arcturus
124 blue 11
127 blue 12
And Majestic, Assorted NIB51
Assorted (mainly clear) 61
Blue (5) (EL 791) 105
Blue 45 and 80, fils. good 30
PZ, NIB (2) 90
Assorted (14) 32
Assorted (15) 12
Assorted (18) 26
Assorted (225+) 18
Assorted octals (50+) 40
Assorted octals (75) 20
Assorted octals (145) (EL 686)10
Assorted octals, 180 (EL 696) 20
Assorted small octals, 420 (EL 688) 13
Assorted large octals, 54 (EL 689) 90
Assorted submin. (50+) 43
Assorted (96) 24
Assorted Daven and RCA 60
Assorted xmtg (10) (EL 777) .. 11
Assorted xmtg (2), good fils. 9
Assorted xmtg (29) (EL 776) .. 35
Assorted xmtg (5) 25
Assorted xmtg, 866 VR box, UV-204A, good fils. 25
Assorted xmtg, starter collection (25) (EL 775) 35
Assorted big-pin, 135 (EL 695)80
Assorted big-pin, 150 (EL 694)80
Assorted miniature, 8 pounds (EL 697) 21
Assorted, C-11, WD-11, WX-12 160
Assorted loktals-acorns-Compactrons (79) (EL 778) 20
Assorted xmtg and one Arcturus blue (EL 693) 17
Assorted, National and Western Electric 50
Assorted, WE 335A, Amperex 575A, Federal F-128A 42
Assorted, WE and others 65
C-1149 11
CECO Type 27 22
Cetron CE-201A tube (industrial), fil. good 15
Cooper Hewitt mercury-arc rectifiers (2) 100, 120
Cunningham or De Forest tubular Audiotron **180**
De Forest
Spherical audion, one lead missing, open fil., broken sealoff tip **310**
DV-2 or -5 & RCA UV-199 14
DV-3 in new box 15
VT-20, open 60
Farad early AC tubes (3), 2 with good fils. 95
GE CG-886 ..... **240**
GE Edison lamp replica ('79?) with '29 carton and card 55
German, Wehrmacht RV2P-style (5), good fils. 50
Gold Lion KT-66s (3), good .. 30
Heintz & Kaufman HK-24G (2), NIB 5
Kellogg 401 20
Kellogg 401, short pins 20
Machlett 861, good fil. 65
Marconi ERECT rectifier valve **550**
Mullard 904V and rectifier U10 13
National Union 01As (5), NIB 47
Raytheon 4B31 w/socket 5
RCA
10s (two), one 50 in ST bulb, tested (EL 795) 60
203As, boxed (2), UV-203A 32
5820 image orthicon 50
UV-201As, brass-based (5). 85
UX-213, new with box 11
UV-216 and UV-201, fils. open 13
Sodion D-21, fil. open 30
Sylvania 8YP4 test CRT 2
Telefunken
EL152 (8) 25
Gleichrichter (rectifier), large '20s xmtg 45
Telefunken & Valvo transmitting 70
Transmitting, Japanese (3) 40
Transmitting, large, fil. open . 41
Tuning eyes (6), fils. OK 30
Valvo QB3/300 7
Western Electric
(11), 274As, 211Ds, 259As, 262B 240
101D (2) 200
101D, 102F, 104D 85
101F, fil. good 10
102F, fil. OK 52
205Ds (3) 160
211D, fil. good 37
211E, fil. OK w/box 22
212D, fil. good, w/box 45
215A, 2 good, one open (EL 797) 16
215A, NIB 35
216A, fil. OK 62
216A, fil. OK (EL 790) 38
216As (3) 125
219D 55
274A 5
331A 8
350B (2) 100
3A photocell 13
D-86326 (special 101D), good fil. 40
VT-1, fil. good (2) 55, 65
VT-1, NIB, box crisp 81
VT-1, open fil. 32
VT-1s (2) 75
VT-2s (2) 125
VT-2s, fil. OK 56
VT-5s, 3 boxed, 1 loose 22
Weagant Valve, open fil. **190**
Welsh WT501 Peanut, fil. OK (2) **70, 75**
Westinghouse 861, open fil. ... 44
X-Ray, rotating-anode, w/field coil 10
45s (6), ST bulb, tested 36
45s (6 - 2 in "S" bulbs), tested (EL 799) 55
2A3s (6), tested (EL 698) 150
2A3s (6), tested (EL 699) 130
6A3s (5), tested (EL 796) 60
201C, Canadian (3), 201 (1) ... 50
KT88, tested good 31
UV-199s, good fil. 43
UV-201As, brass-based & tipped, 4 good, 1 gassy (EL 792) 130
UX-201As (9), tested (EL 798) 105
WX-12, 3 brass, 1 bakelite, good fils. (EL 794) 75

LITERATURE AUCTION

Bruce Roloson, Auctioneer

"EL": Estate Lot

BOOKS

Atlantic Cable, 3 items on 130
Books - Tube-Theory Package (EL 781) 29
Books - Radio-Theory Package (EL 782) 20
Books - Radio-Collector Package (EL 783) 45
Books - Early Amateur Material (EL 784) 34
Books - Early Amateur Material (EL 785) 35
Books - Early Amateur Material (EL 786) 14
Books - Early Amateur Material (EL 787) 31
Books - Radio Collctor-Restorer (EL 788) 30
Books - Miscellaneous 22
Radio brochures, misc., box 14
Calling W1XYZ - Jimmy Keen and the Radio Spies 22
International Electrical Library, S. P. Thompson ... 2
Lefax Radio Handbook, Dellinger/Whitemore 14
Marconi Yearbook of Wireless Telegraphy, 1913 60
Marconi Yearbook of Wireless Telegraphy, 1916 60
Nikola Tesla biography, large format 120
National Radio Institute Vol. 1 12
Pictorial Book of Wireless, Greenwood, others ... 31
Radio Amateur's Handbook, 1927, 2nd ed. 41
Radio Amateur's Handbook, 1942 10
Radio (Operator's) Handbook, ICS 3
RCA HB-3 industrial tube manual, complete 26
RCA Red Book Vol. II (1938-40) 21
RCA Red Book, 1933 16
Riders, Vols. 1-5 abridged and Vols, 3-10 55
Sparton Service Manual 13
Television 1933-50, RCA, 6-vol. set 130
Zenith Service Notes, 1933 19

CATALOGS

Allied catalog, 1941 16
Clapp-Eastham catalog, 1922 40
Electro Imports Co. catalog, 1920 30
Lafayette catalog, 1938 14
Philco catalog, 1939-40 5
Western Electric microphone brochures (2) 14

PERIODICALS

CQ, 1955-67, 128 issues 5
CQ, June '45, April '46, etc. 2
IRE Proceedings, Nov. 1928 6
IRE Proceedings, 1945 issues, w/binder 1
QST, 84 issues 1925-40 (EL 692) 19
QST, 79 issues 1940-48 (EL 690) 5
QST, 69 issues 1948-61 (EL 691) 2
Radio-Craft & Radio News, 20 issues (EL 789) ... 40
Radio-Craft, 11 issues 1930-34 20
Radio News, 17 issues 16
Radio News, 1923-25, microfilm 10
Radio World, 7 issues, 1928-33 10

GENERAL AUCTION

Bruce Roloson, Auctioneer

Database by Dexter Deeley, Richard Neidich, and Barney Wooters

"EL": Estate Lot; "NIB": New In Box

ADVERTISING

Atwater Kent "Jolly Dancing Figure" minstrel doll, uncut (2) 45, 52
CBS 50th Anniv. commemorative microphone paperweight 50
Grebe Radio store-display sign, 3-panel, repro 90
RCA clock, less fluores. tube ... 40
Victor Talking Machine Co. porcelain sign, repro 23

AMPLIFIERS

Fada Model 6, no tubes 400
Grommes 25
Heathkit AA-121 stereo, exc. . 105
RCA clone (early RCA parts) . 35
Seeburg 18A1-L6 juke-box, VG .. 4
WE 25A, no tubes, VG 65
Westinghouse Aeriola AC, VG 200

CRYSTAL SETS

Aeriola Jr. (2) 240, 310
"Flivver," less catwhisker rod 50
Aerophone 52
Cub Scout kit, NIB 80
De Forest Everyman 750
General Radio (British) CRC 16, BBC seal 310
Home-built
(3) 30, 30, 50
Carborundum det., slide coil . 100
British, early '20s 125
Butler type, BBC approved .. 550
With WD-11 amp. 20
With WD-11 amp. in Aeriola Jr. case 90
Howe 85
Knott 80
Marconi and Clairtone 2 transistor and 1 crystal set 80
Orator, w/phones and spare detector in box 600
Philmore Little Wonder 45
Spencer 90
Steinite 150
Sundberg Ace of Hearts 150
Svenska Radio AB Type M 150

KEYS & TELEGRAPH

Keys and Bugs
Speed-X and Vibroplex Champion (one broken) 34
Clapp-Eastham "Boston" wireless, varnished 180
Bunnell legless, and 20-ohm relay 24
Reportedly owned by K. B. Warner of ARRL 35
Swedish land-line, L. M. Ericsson, Stockholm, with plug switch built-in, ca. 1900 650
(2) undetailed 50
Key-on-base, European, mahogany 50
Morse register, Swedish, brass & beveled glass, L. M. Ericsson, ca. 1900 2300
Ticker, Western Union 3A universal, less dome 1700

MICROPHONES

Lifetime Toledo 90

Radio Receptor mic housing 1
Shure 70H 10

MISCELLANEOUS

Color wheel for TV 130
Edison Kinetoscope movie projector, 1897 450
Light-bulb display: Edison replica and small bulbs 45
LORAN navigation indicator ID-6/APN-4 2
"Medical Box" magneto, D. B. Stephens "1854" 40
Metal floor cigarette dispenser and calender 17
Metaphone telephone comm. set, 1901, w/leather case 75
National Velvet Vernier dials, 3 .21
Voltamp voltmeter, 1906 140
Webster wire recorder 30
Weston/RCA voltmeter, remote-control station selector 40
Wimshurst machine 450

RECEIVERS, TUBE BROADCAST

Adler-Royal 160
Admiral 4L28N AC 4
Admiral 6P32-6EIN portable ... 21
Airline Lone Ranger 300
American Bosch 20
American Bosch Magneto 28 ... 25
Arborphone "AC," chassis only .. 5
Armstrong SR-8 25
Atwater Kent
- 9 breadboard, refinished 750
- 20, big box 85
- 20C 65
- 20C, home-made cabinet 20
- 20C, refinished 75
- 40 (2) 40, 55
- 46 40
- 206 105
- Tombstone 70

Belmont 519 160
Brunswick cathedral 85
Canadian Westinghouse
- 57 Special 60
- Radiola IIIA 130

Canadian Ind. Tel. Co. 3-tube, w/4 extra coils 1800
Chickering 5-tube TRF, no case or tubes 25
Clapp-Eastham HR 350
Clarion
- 3-dialer, NT, needs refin. 10
- 85 200
- AC-81 console, VG 30

Colonial 21, less tubes 25
Coronado 686 AM-SW 11
Crosley
- Ace (EL 974) 60
- Pup (repainted?) 220
- 3RR Trirdyn 45
- 51 60
- 51, early style 70
- 52, less tubes 60
- 1121 5
- 6280 30

David Grimes Baby Grand 200
De Forest CS-5 SW set, 1 coil 240
De Forest F-5, good tubes 200
Dewalt B-504 in box 30
Dimmock Bogart Arionola 4 40
Dymac Selecto-Five 25
Emerson
- 511, table 9
- 587A 10
- AM, submin. tubes 100
- AX-212 110
- Treasure Chest 75

Empire Tombstone 35
Emud T7 28
Erla battery 45
Fada 177 AM-SW AC-DC 20
Federal
- B-30, internal speaker 30
- E-10 Ortho-Sonic, no tubes ... 35
- E-40 Ortho-Sonic 20
- Type F Ortho-Sonic 5

Freshman Masterpiece
- Undetailed 20
- No tubes, case refinished 30
- One AFT changed 55

Garod V w/Peerless speaker ... 35
GE 5-70 cathedral 80
Gilfillan 43A 30
Grebe
- CR-9, modified inside 85
- MU-1 Synchrophase (2) 160, 280
- MU-1 Synchrophase, NT 60

Guild "Town Crier" 80
Hallicrafters SR-14 AM set 20
Hallicrafters TW-1000 45
Heathkit EK-2A ed. kit 55
Home-built '20s 3-tube 10
Home-built '20s 4-tube (EL 997) . 15
Jackson 62 Peacock 275
Kennedy Coronet 42 260
Kennedy portable 3-tube 900
Kilbourne & Clark T3 1-tube set, rewired, nice 400
King Neutrodyne (EL 981) 20
Knight Ocean Hopper, 3 coils, VG 60
Kolster 8A battery 30
Lone Star Beer novelty radio . 220
Majestic Melody Cruiser 230
Meissner 8C FM tuner 11
Meissner 9-1091C-7 tuner 10
Mercury Super 10 500
Midwest 15-tube 100
Midwest 1937 chassis 10
Miller tuner, TRF AM 110
Minerva W117 Tropic Master (EL 993) 25
Mitchell 1260 lamp radio w/orig. box 180
Mitchell lamp radio 30
Mohawk one-dial 60
Murdock C.8.32 neutrodyne .. 190
National B-eliminator 50
Northern Electric, 1923 900
Novelty globe radio, '30s 45
Novelty microphone radio, WLBH, less back 110
Osram Four New Music Magnet, English 70
Philco
- 20 cathedral 55
- 20B 250
- 28 (EL 865) 90
- 60 40
- 60A 90
- 70 (2) 130, 200
- 81 50
- 90 cathedral, hums 200
- 118 RX chairside 95
- 511 w/speaker table 70
- 630 tombstone 40
- 32-38 20
- 37-61 cathedral 120
- 42-354 50
- 46-132 21
- 46-200 5
- 49-50C spice-chest set 20
- 50-520 5
- 50-526 6
- 53-562 5
- Lamp radio, new shade 50

Pilot
- 35 bakelite 10
- AM/FM table 1
- T601 Pilotuner 30

Privat-Ear pocket portable, exc. 190
Pye British AM-SW 55
Radio clock 35
RCA
- Radiola III, no tubes 35
- Radiola III (rare style tuning handle) 62
- Radiola III, FET WD-11s 75
- Radiola V, original top 450
- Radiola 18, cabinet troubled 5
- Radiola 18 w/100A speaker (EL 756) 25
- Radiola 20 55
- Radiola 60 w/100 speaker (EL 755) 70
- Radiola AR-812A 95

96T1 110
128 100
1711 battery 15
T8-14 Tombstone 70
RCA Victor
46X23 AM-SW 20
9T 110
6BX63 AC-DC portable 1
T8-14 45
RCA-Brunswick superhet panel (no case) 10
Reinartz 3-tube, '87 "Best of Show" at Auburn 225
Scott 800B, works 200
Scott Phantom Deluxe, good, book, PS needs rewiring 500
Sherwood FM tuner w/book ... 20
Silver-Marshall "Round the World 4," repainted, 3 coils ... 50
Silvertone
20 7
4566 (EL 959) 10
6421 AM-SW (EL 1007) 15
AC AM-SW 35
K7038, AM-SW 40
Undetailed 15
Skylark cathedral 25
Sonora WAU-243 200
Sonora E-850, w/book, NT 35
Sparton
5-15 110
A66 20
Jr. 400-series 160
Splitdorf 40
Star-Lite midget AC-DC, NIB ... 17
Stewart Warner 104A cath. 200
Stromberg-Carlson AM-FM tuner and amp 50
Tele-Tone 347 175
Tilman Model B 6-tube TRF ... 40
Tuner, RCA clone 70
Tuska 224, no tubes 290
Westinghouse
Radiola RS, box only 90
H247 11
WR-10 40
Wireless Specialty IP-501A .. 1500
Zenith
4-V-31 tombstone 80
5R086 radio-phono 7
5R319 160
6D311 80
AM-FM 12
Chairside 60
Transoceanic 6R41 65
Undetailed (2) 40, 120

RECEIVERS, CATALIN

Addison R5A1 900
Emerson Aristocrat 400 350
Fada 1000, ex-blue 2400
RCA Victor 66X9, brown 300

RECEIVERS, IRON

Echophone EC-1B 16
Espey 581 morale set (EL 977) .. 10
Hallicrafters
SX-16 75
S-20/-20R (2) 30, 35
S-27 (2) 25, 25
SX-28 (EL 958) 50
SX-28, exc. (EL 929) 55
S-38 (2) 20, 30
S-40(A)(B) (three) 15, 20, 25
SP-44 panadapter 60
Hammarlund
BC-779, no PS (EL 866) 10
BC-779B, no PS (EL 943) 25
HQ-129X 55
National
HRO 65
HRO, 2.5-V, 6 coilsets, black etched, exc. (EL 853) 190
SW-3, switch added, w/gray PS and 15 coils 390
SW-54 10
R-100/URR (EL 817) 12
RACO Super Clipper SW 50
Wells-Gardner (Navy) RBL-3 w/copy of book (EL 1014) 5

RECEIVERS, TRANSISTOR

Boy's Radio, Pearl, two-xstr 80
Heathkit DF-2 navigator 11
Regency TR-1, good case 210
Sony TR-84 8-transistor 9
Sony TR-818 8
Transistor cathedral 10
Zenith Deluxe Royal 755 5
Zenith 500H 60

SPEAKERS AND HEADSETS

Cone
Crosley Musicone 25
Crosley Musicone and home-built amp. 55
RCA 100 65
RCA 103 65
Western Electric 540AW, exc. 90
Headsets - box lots
12 (EL 763) 95
12 (EL 764) 40
10 (EL 765) 60
Horns
Amplion boxed, folded, exc. . 750
Atwater Kent 35
Brown (English), exc. 160
Home-built, "distressed" gnarled brass-copper 35
Magnavox M-1, Model A 160
RCA UZ-1325 100
Unknown 70
Jensen speaker system 110
RCA MI-4410 system 390
Sonora 40

TEST EQUIPMENT

Audio osc., H-P 200BR, fair 6
Capacitor tester, Heathkit 16
Crystal cal., Meas. Corp. 111B 11
Grid-dip meter, Millen, w/box 40
"Grid" dipper, Millen 90652 solid-state w/book 170
Intermod analyzer - Audio Inst. Corp. 168 16
Lab instrument, Leeds & Northrup, pre-1910 variometer-like, large wood 800
Millivoltmeter, Weston 45 10
Scope, Bell and Howell 34 11
Scope, Clough-Brengle 3" 20
Scope, Millen, amp. and display 50
Scope, National CRR 50
Scope, Tektronix 524D 5
Scope, WE TS-34/AP, less hood 10
Sig. gen., GR (Navy) LP-3, less PS 12
Sig. gen., home-built 1
Sig. gen., Jackson 640 10
Sig. gen., RCA Institutes 1
String oscillograph, GR 338 ... 240
Tube rejuvenator, Sterling 109 435
Tube testers
DayRad 381 11
Eico, w/box 5
Hickok 539B 7
Jackson 648 15
VOM, Mercury 400 2
VOM, RCA Volt-Ohmyst 5
VTVM
AC, Ballantine 300 6
Hickok 125 1
Hickok 209A, w/book & and probes 35
Hickok 215 13
RCA 5
Wavemeter, VHF, HP 758A 15
Wavemeter, Marconi C-2 RCAF 10

WIRELESS/EARLY RADIO GEAR

Loose couplers
Home-built 50
Unidentified 40
Murdock 130
Murdock, and De Forest detector 150
Thordarson spark coil 575
RCA spark oscillation transformer 40
RCA PX-1638 CW transmitting tone wheel 90

OLD-EQUIPMENT CONTEST

Geoff Bourne, for Ralph Williams, Organizer

THE WESTINGHOUSE CATEGORIES

Class 1. Commercial Equipment, Any Period

First: Seth Ward - Early W AC Voltmeter

Class 2. Tubes

First: Bob Murray - Canadian W Tube Display
Second: Richard Brewster - W Tube WT25 *(250-watt, used in 1921)*
Third: John Parsons - W Tubes, Cartons, and Assorted Items

Class 3. Equipment, Beginning to 1930s

First: Stephen Brown - Radiola Grand Display *(a complete set, and two others with components identified. Watch for his article in the next OTB.)*
First: Ed Bell - Aeriola Grand
Second: Todd Prowell - Early W RA-DA
Third: Richard Brewster - W Aeriola Jr. Crystal Set

Class 4. Post-WW-II Receivers

First: (none)
Second: Michael Raide
Third: Bob Raide

Class 5. TV Transmission & Reception (No entry)

Class 6. Military Equipment

First: Richard Brewster - W SE-1012 Navy Receiver *(a WW I radio compass for destroyers, tuning 50 to 100 meters)*

Class 7. Documents & Advertising

First: Jim Sutherland - "Adventures in Research" Radio Broadcast, 1912-54 *(a working four-channel playback display)*
Second: Peter Yanczer - W Sign, 1930s
Third: John Parsons - Radio Station Verifications

THE STANDARD CATEGORIES

Class 8. Passive Receivers

First: William Stokes - "Building an Old-Time Wireless Receiver" *(both the loose-coupler receiver and how it was constructed)*

Class 9. One- & Two-tube Receivers

First: Ron McClellan - F. B. Chambers 1913 Time Receiver *(a rare Audion-detector set)*
Second: George Ayers - Tuska Model 222
Third: Billy Richardson - Browning-Drake

Class 10. Three-Tube Receivers

First: Robert Lozier - German "Peoples' Sets" *(a working display of Volksempfängers and coverage of the social climate that they reinforced)*
Second: Art Kingsley - 1928 French Regen Set
Third: Ross Smith - Federal 110

Class 11. Four- & Five-Tube Receivers

First: Neil Friedman - A. J. Stevens Model F6 *(a four-valve British set)*
First: Eric and Sirelle Fogel - Martian Beauty with Matching Amplifier
Second: David Cheney - Northern Electric
Third: Gale Perkins - GE 1933 K40 AC-DC Set

Class 12. Six-or-More-tube Receivers

First: Ron Frisbie - Golden Leutz Pliodyne-6
Second: Scott MacWilliam - Raven Superhet *(kit receiver from an obscure maker)*

Class 13. Spark Transmitters & Artifacts

First: Mike Katzdorn - Vibroplex Owned by Elmo Pickerill *(with documentation notes)*
Second: Edward White - Combination Boards with Transmitter, Loose Coupler, etc.
Third: Michael Raide - Low-Power 1912 Spark Transmitter

Class 14. Vacuum-Tube Transmitters

First: Allen Jochem - 1937 Battery Portable Amateur Station
Second: Bob Mattson - Gross CW-25 Transmitter
Third: Bob & Michael Raide - Hallicrafters HT-9

Class 15. Novelty Radios (no entry)

THE CRAFTSMAN CATEGORIES (NEW)

Class 16. Restoration of Appearance

First: Ernie Hite - Firth Vocaphone Model A, 1921 *("hero" loudspeaker restoration)*
First: Dave Abramson - RCA TRK-120 Prewar TV-AM-SW Set *(playing original kinescoped TV programs on a five-channel, 12" mirror-in-the-lid set)*
Second: Billy Richardson - Leutz Screen-Grid Phantom with Power Supply
Third: Stephen Short - Grebe CR-9

Class 17. Restoration of Operation

First: Peter Yanczer - Western TV mechanical TV set, ca. 1931 *(In actual operation - scanning-disc camera and amplifier were scratch-built; Felix the Cat doll is original)*

Class 18. New-for-Old

First: Billy Richardson - Federal "109S" Superhet
Second: Donald Holdaway - 1934 Home-Built SW
Third: John Wiesner - Home-Built Short-Wave Radio, 1930s Design

Eunice Thompson Award: Stephen Brown ("Best in Show")
Matlack Transmitter Award: Michael Raide
Display Award (Best Presentation): Floyd Jury - WW I Artillery-Spotter's Radios and the Plane They Flew In

Judges: Geoffrey Bourne for Ralph Williams; John Caperton, Alan Douglas, Richard Brewster, Peter Yanczer, Billy Richardson (self-disqualifying during judging of their entries)
Secretary: Elinor Williams

A-W-A-RDS AND THEIR WINNERS

YEAR	TYNE TUBE	ELLE CRAFTSMAN	THOMPSON	TAYLOR
1980	Bro. Patrick Dowd	Alan Douglas		
1981	John Stokes	Robert MacIntyre		
1982	Lauren Peckham	Lincoln Cundall		
1983	William Condon	-	Ralph Muchow	
1984	-	Mike Katzdorn	Jim & Felicia Kreuzer	
1985	-	Ross Smith	Lauren Peckham	Ken McIntosh
1986	Alan Douglas	A. C. Stoddard	Alan Douglas	Richard Brewster
1987	Rüdiger Walz	-	Jim & Felicia Kreuzer	Edmund Taylor
1988	Bill Orr	Robert Murray	Michael Payne	Stephen Hofer
1989	-	Billy Richardson	Floyd Jury	Peter Yanczer
1990	Gertrude Tyne	Lauren Peckham	Mike Katzdorn	Arnold Chase
1991	John Anderson	-	Jim McKinnon	Pat Leggatt
1992	-	Gordon Symonds	George Freeman	David Johnson
1993	**Edward Herold**	**-**	**Stephen Brown**	**-**

YEAR	CUNDALL OT CONTEST	AWA HOUCK - DOCUMENTATION	AWA HOUCK - PRESERVATION	
1971	W2LV	Thorn Mayes		
1972	W2LV	Bruce Kelley	Ed Raser	
1973	W2LV	Gerald Tyne	Robert Merriam	
1974	W2LV/W0TRF	Lou Moreau	Warren Green	
1975	W1DM	William Breniman	Stuart Davis	
1976	W1DM	Howard Schrader	Wayne Nelson	
1977	W1DM	Ralph Williams	Vance Phillips	
1978	K4TS	Don deNeuf	Lauren Peckham	
1979	W1DM	Ivan Coggeshall	Joseph Pavek	MATLACK
1980	W2LV	Lloyd Espenschied	Ralph Muchow	William Shaw
1981	K4TS	Alan Douglas	John Caperton	-
1982	K4TS	-	Fred Hammond	John Haught
1983	W2LV	Kaye Weedon	Patrick Dowd	Bill Hurni
1984	K4TS	Floyd Paul	Rex Matlack	A. C. Stoddard
1985	K4TS	Hugh Aitken	Ralph Williams	-
1986	W8VSK	Bill Fizette	-	James Miller
1987	W2BJI	John Nagle	-	John Rollins
1988	W1YG	Don Patterson	Robert Lozier	John Rollins/Marshall Etter
1989	W2VDI	Bob Morris	Bruce Kelley	Neil Wiegand
1990	W2ER	Morgan McMahon	Charles Dachis	Bob Mattson
1991	W2ER	John Anderson	Bob Paquette	John Rollins/Parker Heinemann
1992	W1YG	Tom Lewis	Al Jones	Mike Raide
1993	**W2ZM**	**Bill Holly**	**Mike Feher**	**Mike Raide**

YEAR	DISPLAY	PRESIDENT'S	BK-OTB
1986	Franz Mock/John Glisson	Arlene Roloson	
1987	Max de Henseler	Bruce Kelley	
1988	Bill Fizette	Sherwood Snyder	
1989	Robert Lozier	Helen Kelley	
1990	Jerry & Marsha Simkin	Richard Neidich	Jack Kingman
1991	Floyd Jury	Dexter Deeley	Lloyd Espenschied
1992	Robert Murray/Robert MacIntyre	Bill Fizette	Robert Murray
1993	**Floyd Jury**	**Ludwell Sibley**	**Peter Yanczer**

Awards follow these criteria: **Tyne Tube**, honoring Gerald Tyne, for contributions to preserving or documenting the history of tube technology; **Elle Craftsman**, in memory of Bruce Elle, W2VTR, to a builder of high-quality communications equipment of old or new type; **Thompson Best of Show**, in honor of early amateur Eunice Thompson, W1MPP, for an entry in the equipment contest at the Annual Conference; **Cundall Old-Time Contest**, in memory of Lincoln Cundall, W2LC, to the winner of the AWA old-time CW contest; **AWA Houck - Documentation** and **- Preservation**, to remember Harry Houck, radio developer, for achievement in documenting radio development/history or in collecting/documenting radio artifacts respectively; **Matlack**, via support of Rex Matlack, W3CFC, for excellence in constructing or restoring amateur equipment; **Taylor**, in memory of John Taylor, RCA television developer, for preserving TV history; **Display**, for quality and informational value in an exhibit at the equipment contest at the Annual Conference; **President's**: chosen by AWA's president, for outstanding service to the Association; **BK-OTB**, via support of Bruce Kelley, for the outstanding original *OTB* historical article of the award year.

AWA NEWS

CALENDAR

Nov. 6	CHRS swapmeet, Redwood City
Nov. 7	AWA annual bus. meeting, Rochester
Nov. 12-14	1929 QSO Party
Nov. 19-21	SCARS meet, Norwalk
Feb. 6-7	1994 Classic Radio Exchange
Feb. 9-10, 12-13	Old-Time CW Contest
May 7	AWA Spring Meet, Bloomfield, NY
May 21-22	Rochester Hamfest (AWA exhibit)

OTB POLICY ON PROMOTING EVENTS

You get the info to us, and we'll announce it.

For joint club-AWA meetings (with slide shows, etc.), please send the information in through Richard Ransley, the coordinator. For stand-alone club events, just get it in to the *OTB* editor - addresses on the inside front cover. Elegant format is not necessary; timeliness is. We don't want a nice printed brochure, too late to be used; we need the simple facts up-front. This section of the *OTB* is the last to close, about 4½ weeks before the nominal date of the next issue.

After-action reports are welcome, for events that have been announced in the *OTB*. Being *news*, they should be sent in while still fresh.

RECURRING MEETINGS

California Historical Radio Society. Quarterly swapmeets in the Ampex Corporation parking lot in Redwood City (Nov. 6). Gates open at 8:00 AM. Regional events: General address is CHRS, PO Box 31659, San Francisco, CA 94131; 24-hour voicemail info: (415) 978-9100). (Info from Mike Adams)

Delaware Valley Historic Radio Club. This club in southeastern Pennsylvania meets the second Tuesday of each month (Nov. 9, Dec. 14, Jan. 11), at the North Penn Amusement Building, 105 Main St. (alias Rte. 113), Souderton. The meeting includes an equipment auction. Membership is $5/yr. For details: PO Box 624, Lansdale, PA 19446, or Jay Daveler, (215) 368-2520.

Hudson Valley Antique Radio & Phono Society. Meetings the third Thursday of the month (Nov. 18, Dec. 10, Jan. 20) at 7 PM. For meeting, swapmeet, and membership info, write HARPS, PO Box 207, Campbell Hall, NY 10916 or call John or Linda Gramm at (914) 427-2602.

Mid-Atlantic Antique Radio Club. Meets monthly at the New Hope Seventh Day Adventist Church in Burtonsville, MD, Saturdays at 6:30 PM (Nov. 20, Dec. 18). Contact: Lloyd Kendall, (703) 471-6143, or Joe Koester, (301) 725-4229.

New Jersey Antique Radio Club. Meets the second Friday of each month (Nov. 12, Dec. 10, Jan. 14) at 7:30 PM. Holds three swapmeets a year. Contact: send SASE to Tony Flanagan, 92 Joysan Terrace, Freehold NJ 07728, (908) 462-6638.

Oklahoma Vintage Radio Collectors. Meets the second Saturday of each month (Nov. 13, Dec. 11, Jan. 8), at Spencer's Barbecue Restaurant, NW 63rd and May Ave. in Oklahoma City. Dinner and socializing starts at 6 PM, meeting at 7. Membership is $12 per year and includes the monthly *Broadcast News*. More info: SASE to OKVRC, PO Box 72-1197, Okla. City 73172-1197; or call (405) 722-0595 or (405) 755-4139 eves.

Southern California Antique Radio Society. Quarterly flea market and lunch at the Velvet Turtle on Sepulveda Blvd. in Torrance, on the third Saturday of each third month. Meeting at the Ramada Inn in Norwalk, Nov. 19-21. Information: Floyd Paul, (818) 242-8961.

SERVICE SOURCES AVAILABLE

The "AWA Source Sheet," a listing of parts suppliers and services for the radio collector. Cost: only a business-size self-addressed stamped envelope, to AWA, Box E, Breesport, NY 14816.

AWA NET - ATTENTION AMers

We're back on the Sunday 5 PM EST schedule near 3837 kHz with vintage equipment. Look for W2ZM's 1937 Frank Jones high-power AM transmitter. AA2CU and W2AN are NCSs. - BK

1994 CLASSIC RADIO EXCHANGE

February 6-7, 2000 UTC Sunday to 0400 UTC Monday. The Classic Exchange, "CX," celebrates the commercial and homebrew equipment that was the pride of our ham shacks a few decades ago. Object is to restore, operate and enjoy older equipment with like-minded amateurs. A Classic Radio is at least 10 years old, an advantage but *not* required to operate CX. You can use anything, although new gear is a distinct scoring liability and less fun!

Exchange your name, RST, QTH, receiver and transmitter type (homebrew: send final-amp tube or transistor) and other interesting conversation. The same station may be worked with different equipment combinations on each band and each mode. On CW call "CQ CX," on phone call "CQ Classic Exchange." Non-participants may be worked for credit. Suggested frequencies: CW up 60 kHz from low band edges; phone 3880, 7290, 14280,

21380, 28320 and/or AM frequencies; Novice/Tech 20 kHz up from low band edges. 7060 and 3560 CW tend to be the most popular CX freqs.

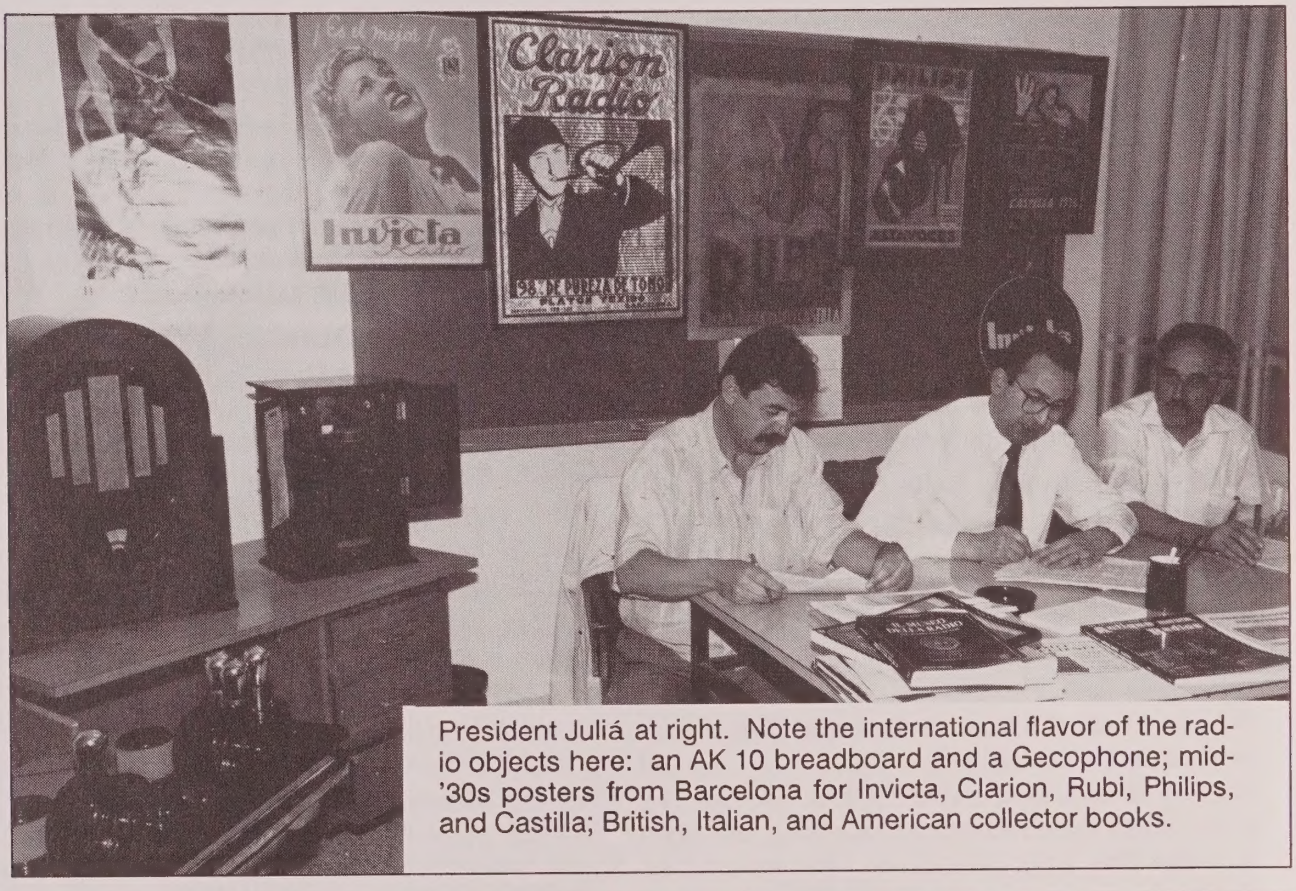
Scoring: multiply total QSOs (all bands and modes) by the following sum: [total number of different rcvrs and xmtrs worked on each band and mode + total number of states/provinces/countries worked on each band and mode]. Multiply that total by your Classic Multiplier: the total years old of all rcvrs and xmtrs used, three QSOs minimum per unit to qualify. If equipment is a transceiver, multiply age by two. If homebrew, count as 25 years old unless actual construction date or design is older.

Certificates are awarded every now and then for highest score, exotic equipment, best excuse, etc. Send logs, anecdotes, pictures to: Jim Hanlon, W8KGI/5, PO Box 581, Sandia Park, NM 87047; or Marty Reynolds, AA4RM, PO Box 13354, Atlanta, GA 30324. Include SASE for the next *CX Newsletter*. (Stu Stephens, K8SJ)

COLLECTOR'S CLUB STARTED IN SPAIN

A society has been organized in Granollers (Barcelona) for collectors of vintage wireless and related material. Termed the Friends of Radio Cultural Association (in Catalàn, Associacio Cultural Amics de la Radio), this group is intended for all who are interested in the history of radio in Spain. Its main objectives are to encourage the growth of collecting, aid cooperation between collectors, and provide technical documentation. A long-range goal would be establishment of a vintage-wireless museum, as there is no such public museum in the country at present.

The address for more information is Associacio Cultural Amics de la Radio, C/. Rei Jaume, 55, 08840 Cardedeu, Spain. Contacts are Juan Julià, president, tel. 93-8671794; or Esteve Pujal, vice president, tel. and fax 93-8794286.



President Juliá at right. Note the international flavor of the radio objects here: an AK 10 breadboard and a Gecophone; mid-'30s posters from Barcelona for Invicta, Clarion, Rubi, Philips, and Castilla; British, Italian, and American collector books.

NEW COLLECTOR MONTHLY LAUNCHED

Many AWA members enjoy Marc Ellis' excellent column on antique-radio topics in *Popular Electronics*. Now comes word that he is starting a monthly publication of his own. With the working title *Vintage Radio* (the final name will be similar but different), it will be pointed toward those getting started in radio collecting and restoration. The pilot issue, as revealed at Rochester, has six pages (8½" x 11" format) with a well-written feature on electrical safety in restoration (it may save someone's life!), a "Q & A" column, a review of a vintage repair handbook that is still available and useful, a directory of clubs, an events calendar, and a page of want ads. The layout is professional and readable. As a simple but novel idea, the paper is prepunched for easy retention.

The first "live" issue (Jan. 1994) is scheduled to be mailed in mid-December. Rates are $20/year ($21.50, US funds, to Canada; $35 by air to other countries), with a special coupon offer for charter subscribers. The address: P. O. Box 1306, Evanston, IL 60204-1306.

ANNOUNCING AWA REVIEW, VOLUME 8!

The 1993 issue of the AWA Review, introduced at the Conference, is now available.

In "**Unusual Military Morse Keys**," Louis Meulstee presents a group of British and European wireless and radio keys, with photos of the equipment that used them. This includes some intriguing "agents' sets" and military radios from the West and the Eastern Bloc.

Years ago, tube expert Gerry Tyne gave a talk to an AWA conference audience on some particularly early and scarce tubes. His "**Rare Tubes: How to Recognize Them, and Why They Are Rare**" has been brought from the archives with the aid of photos by collector Jerry Vanicek.

Today's radio historian knows of Reginald Fessenden vaguely, as a prolific wireless inventor. However, we are generally unaware of the variety and volume of his publications. "**A New Bibliography of Reginald A. Fessenden**," assembled by David Kraeuter, shows how extensive those writings were.

The Federal Telephone and Telegraph Company of Buffalo made numerous collectible radios, from the Junior crystal receiver and Model 61 tube set to the "Ortho-sonic" consoles of 1929. But about two-thirds of Federal's lifespan was in the telecommunications industry, struggling with the local Bell company for survival. "**'Federal' as a Telephone Company**" by Ludwell Sibley shows the forgotten side of this firm.

The *other* Federal was the California group that built arc transmitters and provided domestic and transpacific radiogram service. Its direct descendant is in business today. "**The KFS-Federal-Mackay Story: From CW Arc to Silicon Valley**" by Hank Olson, W6GXN, and Bill Orr, W6SAI, traces the origins of today's coastal station KFS from Federal.

One of the greater surviving collections of early vacuum tubes is the one assembled by a figure little known today. In "**Joseph T. Fetsch: Vacuum-Tube Engineer and Collector**," Jerry Vanicek covers the career of this individual and gives photo coverage of his collection.

Many of the prime radios of WW I vintage came from "NESCO." In 1961, AWA printed Ted Duvall's "**A History of the National Electrical Supply Co.**" NESCO can be traced back to 1885 or so, and forward to present-day electronics firms like Potomac Instruments. We've updated this history and expanded it.

In Review 6, Fred Chesson published his handy directory to Signal Corps radios of the 1915-43 BC-SCR-RC era. Now, in "**Navy Electronics Directory**," we have a comparable guide to Navy electronic equipment of the same vintage, that is, up to introduction of the "AN" nomenclature system.

Many AWA members have had experience "debugging" newly built transmitters for efficiency and stability, but we have no idea how hard this work was in the early days. "**A Glimpse at Old-Time Transmitter Development**" is a 1930 report by GE engineer Walter Nelson on his difficulties - and success - in taming a *big* (200-kW) experimental broadcast transmitter.

The book, with 154 pages and 163 illustrations, is priced at $12.50 postpaid (U. S. and Canada; $14 ppd elsewhere). It may be ordered with the form enclosed with this *OTB*, or by sending a check payable to "Antique Wireless Association" to AWA, 44 E. Main St., Flemington, NJ 08822-1224.

OTHER REVIEWS STILL AVAILABLE

VOL. 6

▪ **The Eaton Tube Collection** (George Clark, Bruce Kelley, Lauren Peckham, et al.); ▪ **The General Electric Company Considers Buying the De Forest Radio Telephone and Telegraph Co., 1916** (John Anderson); ▪ **The First Years of Wireless in the Hawaiian Islands** (Robert and Tina Wiepert); ▪ **A Review of Early Television in the U. K.** (Pat Leggatt); ▪ **Signal Corps SCR-BC-RC Directory** (Frederick Chesson); ▪ **Who Invented the Superheterodyne?** (Robert Champeix, translated by Richard Foster); ▪ **Amateur Radio in the New York City Area Pre-WW I** (Daniel McCoy); ▪ **Radio Tube Manufacture in Australia** (Fin Stewart); ▪ **The Military Communications Explosion, 1914-18** (Louise Moreau); ▪ **The U. S. Patents of Alexanderson, Carson, Colpitts, Davis, Gernsback, Hogan, Loomis, Pupin, Rider, Stone, and Stubblefield** (David Kraeuter)

VOL. 7

▪ **Ricevitore Popolare Italiano** (The Italian People's Receiver) (Robert Lozier); ▪ **Memories of Early Electron-Tube Development** (Edward Herold); ▪ **The First High-Power Transmitter at Poldhu** (Desmond Thackeray); ▪ **Secret Tubes for Radar - the Western Electric 700-Series** (Ludwell Sibley); ▪ **Military Electronic Equipment - Naval Equipment Manufacturers** (Frederick Chesson); ▪ **A Brief History of the Valve Audio Amplifier** (Carlos Fazano); ▪ **The Eaton Tube Collection Revisited** (Jerry Vanicek); ▪ **The Arc Method of Producing Continuous Waves** (William Byron); ▪ **The Goddard Oscillator** (M. D. Hall); ▪ **The Evolution of Broadcasting from the Transmitter Viewpoint** (author unknown, located by John Anderson); ▪ **Index and Additions to Patents Lists** (David Kraeuter)

These earlier volumes are orderable the same as Vol. 8.

WERE THERE TRANSISTOR RADIOS BEFORE THE TR-1?
(OF COURSE THERE WERE!)

Jim Troe
111 Skyline Dr., Morristown, NJ 07960

That may seem to be a funny question to ask. Ask any collector, at least any transistor-set collector, and they will tell you the "first" transistor radio was the Regency TR-1. And that is the correct answer if we mean "what was the first full-feature transistor radio marketed to the public?". However, any first publicly offered product is preceded by research, engineering, experimental breadboards, prototype designs, demonstration models, etc. Here we will look at some of the radio design activity that preceded the TR-1 design program, with final attention to a feasibility-demonstration set fabricated at Bell Laboratories. It may well be the first portable transistor superhet radio ever built that would operate over the whole broadcast band . . . the grandfather of the TR-1.

Bell Laboratories announced the invention of the point-contact transistor on June 30, 1948 to an invited group of scientists, science writers, and other members of the press, at Bell Labs' New York City headquarters. Thus was introduced the new age of semiconductor electronics. Doctors John Bardeen, Walter Brattain, and William Shockley of Bell Laboratories were given credit for the invention, and in 1956 the three received a Nobel Prize for their work. Members of this team had fabricated and demonstrated, internal to Bell Laboratories, the first transistor in December, 1947. However, like most significant inventions, their work was preceded by the exploratory work of others, and was directly supported by many in the Bell Labs research organization. Shockley's research on solid-state amplifiers actually started as early as 1938. The push in the 1940s to develop a practical solid-state amplifier was driven by Mervin Kelly, later president of Bell Laboratories, who recognized that future telephone switching offices had to be based on something other than power-

The demonstration-model transistor radio.

Photo: AT&T Bell Laboratories.

consuming and slow electromechanical relays and vacuum tubes.

At the June 30 announcement, Bell Labs demonstrated various devices using the new transistor. These included audio-frequency amplifiers and oscillators. A radio was also demonstrated. However, it was quite crude, using a diode detector followed by transistor audio amplification, since the transistors would not operate at RF frequencies.

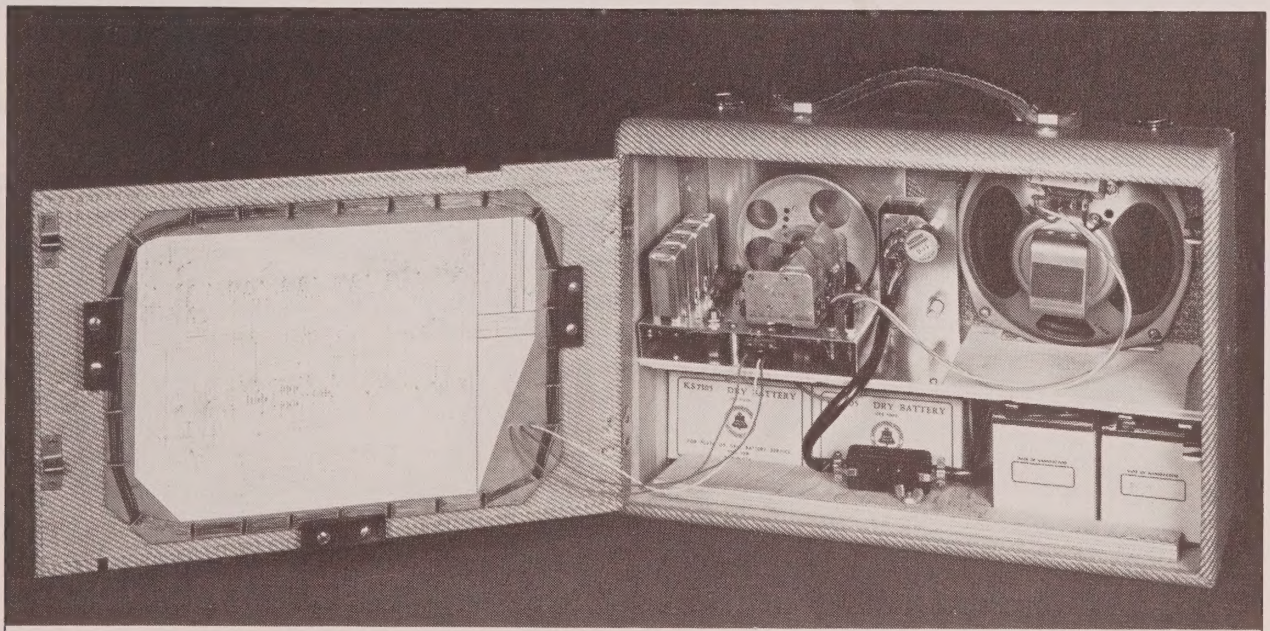
Following the initial announcement, Bell attempted to license their transistor patents, but industry was slow to show interest. Fabrication of the early transistors by Bell Laboratories and Western Electric was as much an art as a science. The electrical characteristics of supposedly similar transistors varied widely.

Bell held a symposium in 1951 for industry, military, and education representatives, again to stir up interest in this new technology. However, industry remained slow to make anything happen. Bell announced a novel licensing plan. For a fee of $25,000, deductible from future royalties, Bell would make known to the licensee all that it knew about making transistors. Companies started buying licenses. A symposium for licensees was held in April 1952, and things then really started to happen in industry.

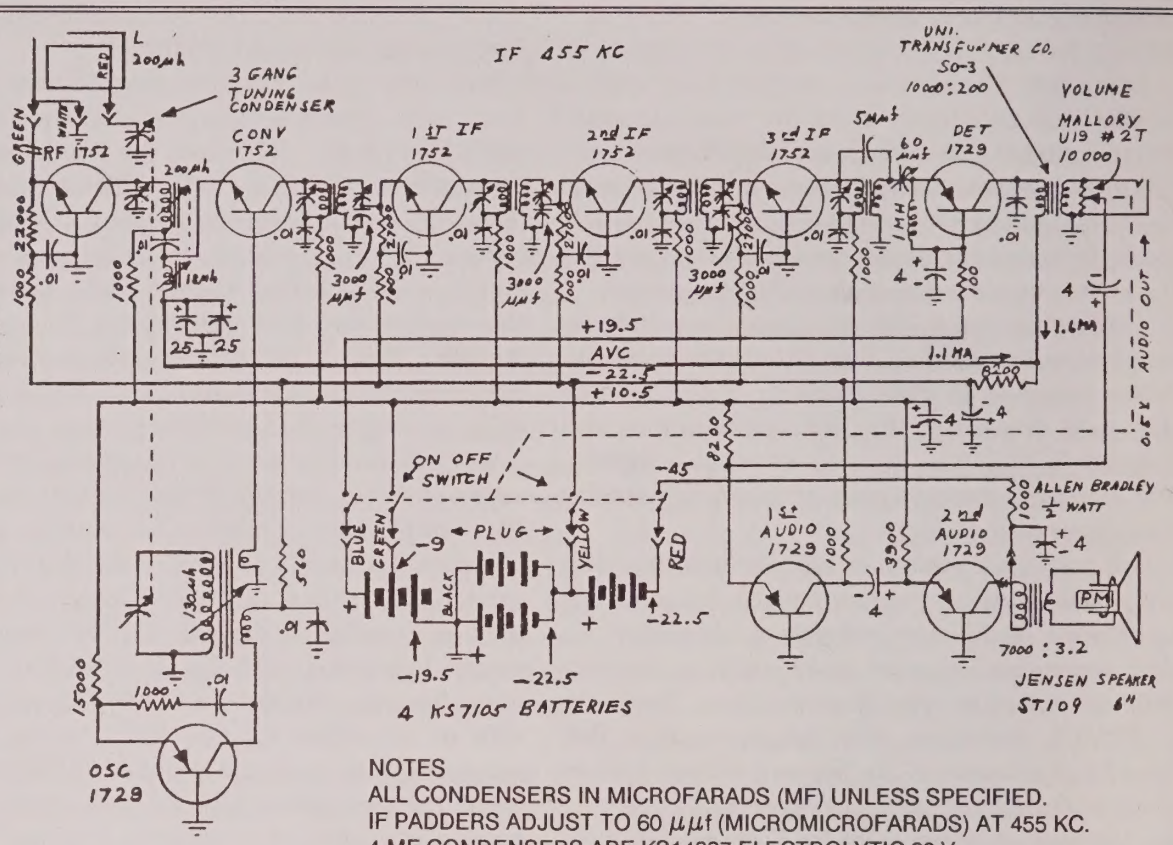
It is interesting to note that a small, relatively new company called Texas Instruments was one of the first licensees. This in turn led to the bold plan in TI to design and market a pocket-sized transistor radio by Christmas, 1954. After TI could not interest any major U. S. radio company to join them on such a speculative venture, TI selected the Regency division of Industrial Development Engineering Associates (IDEA) to manufacture the TI-designed set, and thus came the TR-1.

But back to the transistor development and related radio research that preceded the commercialization phase. WE made the first commercial transistors available in 1951. These were used largely by the hearing-aid industry. Articles became visible in the popular technical magazines on how to build transistor radios. Little appeared in the engineering press, such as the *Proceedings of the IRE*. The earliest of the radios defined in the electronic hobby press were small broadcast sets using a simple diode detector using one tuned circuit, followed by a two- or three-stage transistor audio amplifier, usually driving an earpiece. The Western Electric transistors that were on the market were not usable much above the audio spectrum. This author and colleagues at Bell Labs built such radios in the early 1950s using experimental transistors, with the set tunable to the airways channels. We then took these very small sets with us on airline trips to listen to the cockpit communication with the ground. This ended in more than one debate with the cabin crew or flight captain as to what we were doing, and was it legal!

In October 1952 *Popular Science* published construction information on a broadcast radio using three transistors, a transistor detector followed by two stages of transistor audio amplification. This set was truly an all-transistor radio. It even provided loudspeaker volume on local stations. The transistors used were the only ones on the market, the A-1698 by WE, which had to be ordered directly from the factory at Allentown, Pennsylvania, at $6.50 each. The construction article carefully



Rear view. The loop antenna is custom-made from magnet wire. Pasted inside the loop is a circuit diagram, a copy of BTL drawing BA-344073. The four tapped 22½-volt batteries are Western Electric KS-7105s with date codes of 5-5-51. Circuit is an RF stage (1752), converter (1752), three IF stages (also 1752s), detector (1729), and two audio stages (1729s). Operating voltages in the set are +19.5, +10.5, -22.5, and -45. All transistors are in common-base configuration. The speaker is a good-sized Jensen. *Photo: AT&T Bell Laboratories.*



NOTES
ALL CONDENSERS IN MICROFARADS (MF) UNLESS SPECIFIED.
IF PADDERS ADJUST TO 60 $\mu\mu$f (MICROMICROFARADS) AT 455 KC.
4 MF CONDENSERS ARE KS14337 ELECTROLYTIC 60 V.
25 MF CONDENSERS ARE KS14477 ELECTROLYTIC 8 V.
ALL RESISTORS GLOBAR 1/10 WATT UNLESS SPECIFIED.
TRANSISTORS MUST BE SELECTED { 1729 POINT CONTACT TYPE / 1752 JUNCTION TYPE }
BATTERY LIFE APPROXIMATELY 200 HOURS, 3 YEARS SHELF LIFE, 80%.

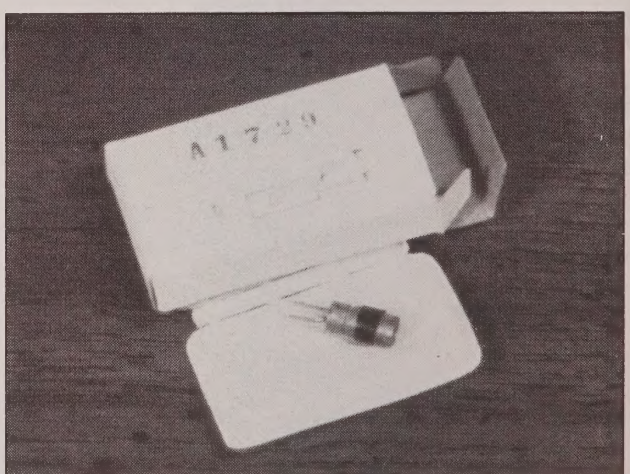
points out that "transistors have a higher noise level than tubes, draw more plate current (although no filament juice), and are far from uniform. Some work better as detectors, others as amplifiers. You take pot luck when you buy, but that is the price of experimenting - and part of the fun."

Following announcement of the transistor, and before any commercial availability of transistors to the outside world, there was considerable activity inside Bell Laboratories to develop equipments that would use transistors. This work took two directions. The first was toward products that could be used in the Bell System telephone network to improve its operation. The other was to develop demonstration products that would show the feasibility of product opportunities to outside industry. Radio circuit design followed both tracks.

In October, 1949, C. H. Swannack and E. Hebert published an internal Bell Laboratories memorandum that reported on design work they had done

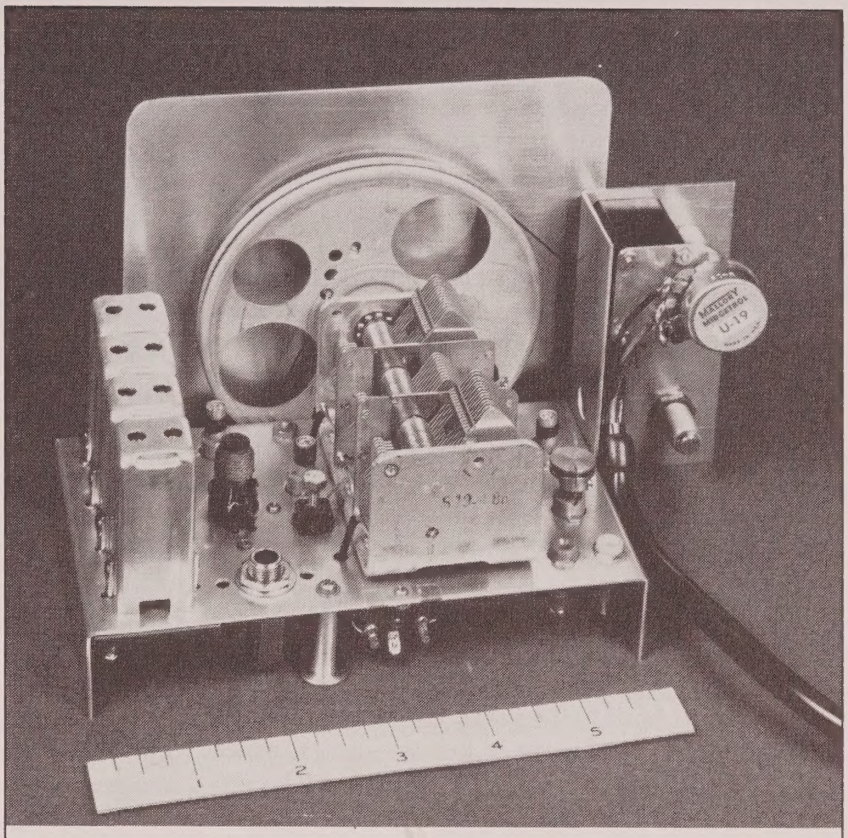
The dial face on this technology-demonstration set appears to have been hand-made in the model shop with a Leroy lettering set.

Photos: Jim Troe

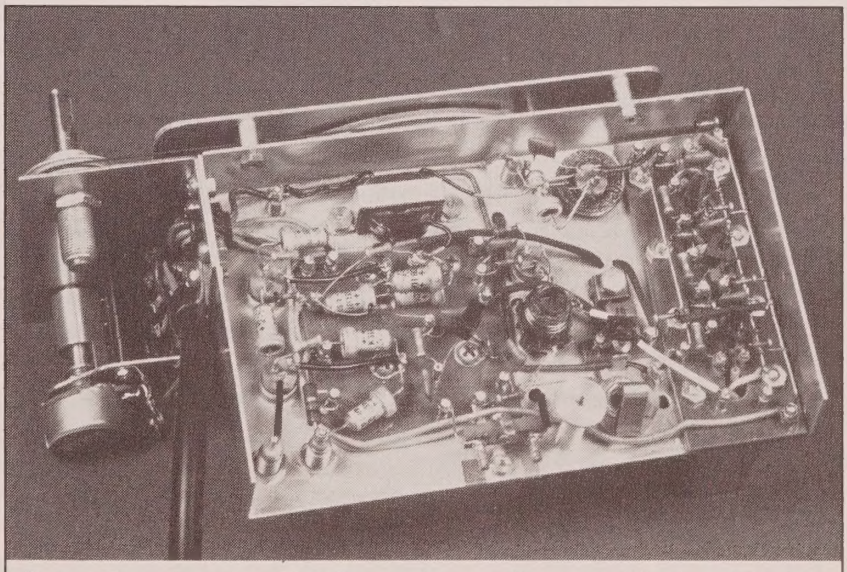


An (A)1729 pilot-production transistor from Allentown. The base lead connects to the plated brass case. The bit of black plastic tubing covers the hole for the wax filling.

to investigate the feasibility of using transistors in a radio receiver, particularly in a new mobile-radio telephone set that was then under development in the Whippany (NJ) Laboratory. In the memo, they describe their attempts to design IF amplifiers for the receiver, at 455 kHz, 2.0 MHz, and 2.9 MHz. It is interesting that of 100 Type A transistors they obtained for the experimental design work, only nine had characteristics suitable for consideration at 2.9 MHz. Since performance was better at 455 kHz, most of the experimental design was done there. Attempts to develop circuits for use in the new mobile telephone were abandoned. Work was shifted to design of a broadcast receiver, in order to gain design experience. They claim to have gotten a complete superhet radio receiver operating. It used 16 carefully selected transistors, each chosen to work best in a particular stage of the set. Performance was not good compared to vacuum-tube sets of the day, but it did work. It demonstrated the feasibility of someday designing commercial-quality sets, with continued improvement in transistor characteristics, yield, quality control, and reliability. There is no indication that this work was taken beyond the breadboard stage, or that the radio was made to operate over the whole broadcast band.



Rear view of the chassis. The jack at lower left is the PA-system output. Special sockets made by Cinch hold the 1752 detector/audio transistors. Note the round heat sink clamped to the output stage, lower right. *Photos: AT&T Bell Laboratories*



Below the chassis. The flanged capacitors are Western Electric KS-14337 tantalums, date-coded 9-51. The 1729 RF/IF transistors, molded in black rectangular plastic cases, are wired-in.

As of now, nothing more is known of ongoing transistor radio experimental receiver development in Bell Laboratories, until F. E. Radcliffe, of the Electronic and Television Research Department, published an internal memorandum dated January 7, 1952. It reported on his work done in 1951 to develop a fully working portable transistorized superhet broadcast receiver. The set is shown in the accompanying illustrations. It is likely that it was designed and fabricated to demonstrate to the new patent licensees that it was possible to design a portable transistor broadcast receiver, with performance competitive with tube sets. The significance of the work is evident by the distribution list on the memo. The list of 18 persons included such Bell Laboratories scientists as H. S. Black, J. A. Morton, R. M. Ryder, H. T. Friis, and W. Shockley.

The receiver design used five junction and four point-contact A-type transistors. It had a battery life of 200 hours with a power input to the set of 1 watt and an output to the speaker of 0.1 watt. This is about twice as good as portable tube sets of the

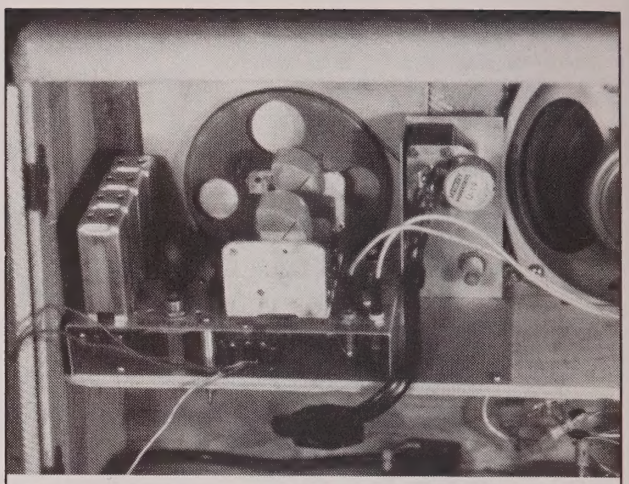
time. There was no attempt at miniaturization of the radio, since the primary purpose was to show design feasibility. To save design time, conventional radio components were used, modified as necessary to work with the transistors.

The measured performance of the design demonstrated feasibility to match the performance of tube designs. Sensitivity was recorded as, "30 microvolts into the RF emitter produced 50 milliwatts output to the speaker, with 10 percent distortion." The image ratio was 80 db. The receiver was said to be more noisy than a tube set, but the noise was not noticeable when tuned to a strong station. Three stages of IF were required, since the stage gain was low compared to tube designs.

A jack was provided at the output of the detector to feed a PA system for use in auditorium demonstrations.

Radcliffe reports that, ". . . design of the oscillator to track with the RF stage and operate roughly between one and two megacycles turned out to be a project in itself." This was basically caused by the low cutoff frequency of the transistors, which in turn causes Radcliffe to write ". . . it will be diffiult to build a set with a short wave band such as is common in vacuum tube radios due to the low gain and low cutoff frequency of transistors."

It is only a guess so far, but the evidence indicates that Radcliffe's radio may be the first completely operational superhet broadcast-band portable radio that operated well enough to be considered the grandfather of the TI/Regency TR-1 commercial set that followed in late 1954, three years later. As far as is known only one such radio was fabricated. Fortunately it was saved from the trash bin after it had served its purpose, and is now in the author's collection.



The set today, still clean after 41 years. The jacks on the chassis have been hand-stamped with the standard W. E. "stenciling" set, and the 426-type diodes at the bottom right seem to have been added as a way to eliminate batteries.

Photo: Jim Troe

SOME EARLY TRANSISTOR APPLICATIONS

The Regency TR-1 pocket radio of December 1954 is a main date reference for collectors, but several commercial and military transistor applications predated it, and many important uses appeared just after it. Here are some examples, with transistor types cited where known.

Andrea Radio AN/AIC-10A aircraft intercom, replacing tube AIC-10, ca. 1954.

General Radio 1307-A audio osc., 400/1000 Hz, (1) CK-721, (3) 1.25-V batts, "first commercial solid-state test equipment," Nov. 1954.

LEL wrist radio, regenerative det. and 2 audio stages, (3) PNPs, 6-V batt, earphone, Dec. 1955.

Meyers Radioear hearing aid; (3) CK-715; 1, 2, or 3 1.25-V batts, late 1952 - early 1953.

Regency TR-1; (1) TI-210, (2) TI-222, (1) TI-233; 22½-V batt., Dec. 1954.

Remler aircraft microphone, dynamic with transistor preamp built in, March 1954.

Signal Corps (Western Electric?) TA-257 negative-impedance telephone repeater, field wire, (1) 2N27, 3-V and 22½-V batts., to replace EE-99 tube repeater of WW II, under test Jan. 1956.

Sony TR-55, sold in Japan, 2T51; (2) 2T52, 2T53 or 2T61, 2T12; 6-V batt, PC board. Output power only 10 mW. Aug. 1955

Sony TR-57, sold in Japan; (4) NPN, (1) PNP; 22½-V batt., simpler/direct-coupled TR-55, early 1956.

Sony TR-72, "deluxe" table model expanded from TR-55 circuit, sold in Japan; (1) 2T51, (2) 2T52, (1) 2T61, (3) 2T62; 4.5-V batt, 4" x 6" speaker, 50 mW out, mid-1956.

Transistear hearing aid, sold in Japan; (2) 2T61, (1) 2T62; 1.5-V bat., transformer-coupled, mid-1956.

Western Electric multifrequency-pulsing tone supply, six audio oscs., for No. 5 crossbar switching office, in trial use at Englewood, NJ, Oct. 1952.

Western Electric 149A Amplifier, (1) 2A, route-translation card reader in 4A toll crossbar switching system, +130-V battery supply, in-service at Pittsburgh Mar. 1953.

Western Electric 151A Amplifier, (1) 4A, in 532 amp. telephone set, powered by tel. line, mid-1954.

Western Electric TS-712/TCC-11 test set, included 1600-Hz osc. for telephone signal tone, (1) A-1723, powered by 20-Hz magneto in lineman's field phone, ca. 1953.

Zenith Royal hearing aid, (3) CK-718, 1.5-V batt., transformer-coupled, late 1952 - early 1953.

Zenith 50X4 hearing aid; (2) CK-784, (2) CK-785; 1.5-V batt., R-C coupled, mid-1956. - LAS

THE TUBELESS RADIO HOAX

Edward W. Herold

BACKGROUND

Reader: try to put yourself in my frame of mind in January 1948, some six months before the announcement of the invention of the transistor. I had been at RCA for 18 years in research and development of electron tubes. I shared with many of my colleagues the belief that something better was likely to come along. We knew of several nonthermionic patents that no one had been able to make work [1, 2] and there was a flurry of excitement in 1938 when a working three-electrode solid-state device was described [3]. Unfortunately, it used ionic conduction, was too slow to be useful, and was likely to have a very short life. Our own efforts starting in the 1930s had not come up with anything useful and it was frustrating to think we might be missing something (we were!).

Then, that January, RCA was invited to see a demonstration of a radio made without electron tubes. The invitation came from two Philadelphia businessmen who were backing an alleged inventor named Goldman. Elmer Engstrom, head of RCA Laboratories at that time, asked Clarence Tuska, head of our patent group, and me to join him to see this remarkable development. In addition to the three of us from Princeton, RCA sent Ewen Anderson, who headed patent licensing, and Doug Smith and Allan Glover from RCA's electron-tube division. Our visit was made on January 13, 1948.

THE DEMONSTRATION

The address we were given was South Street, near Second Street, close to Philadelphia's waterfront on the Delaware River. The building, called the Marine Building, housed our presumptive inventor who operated under the impressive name International Research and Development Co. What we saw was somewhat less so: a messy office with empty Coca-Cola bottles on the floor and a desk covered with a miscellany that included a comic cartoon magazine. The working area resembled a radio servicing operation and Goldman appeared to be a typical serviceman. On the other hand, there was a blackboard with data on immersion heaters which we were told the company was testing.

What we were shown was two RCA receivers, an unretouched model 65X1* and a similar one which Goldman said he had modified to eliminate the tubes. The two chasses were similar except that all the tubes and the IF transformers in one had been replaced by two sealed cans with a total volume of about 100 cubic inches. The bottom was hidden and the set enclosed in clear plastic so nothing could be touched. The tuning capacitor, loop antenna, and loudspeaker were the same on both chasses.

Mr. Goldman told us that his new device could do anything that electron tubes could do; it could amplify, oscillate, and rectify. He said no vacuum was involved, no gas discharge, and the device could be made in any component factory by ordinary skilled help without special training.

The demonstration was indeed impressive. Goldman's receiver turned on instantly (the normal 65X1 required over 10 seconds' warmup) and used only five watts from the AC line (the 65X1 drew 25 watts). Maximum speaker sound output was about the same, probably a watt or so into the output transformer. The tuning range was the same in the two sets and, using a serviceman's RF generator, we were shown that the IF was the same and the image response was in the usual place. In only one respect was the performance unequal, in that the response to very weak signals was slightly poorer. Goldman explained this as due to the loop antenna being too close to the metal cans, thereby reducing the pick-up.

Goldman also demonstrated a remarkable feature of this receiver. When he used a Variac in the power-line input, the set continued to operate down to a line voltage of 30 volts, with an input of well under ½ watt. The maximum sound output was reduced but was still very usable. At this point I noticed something that made me suspicious. It seemed that before Goldman unplugged his receiver from the AC line, he first turned down the volume control and its on-off switch. I did not comment to Goldman on this point.

Our initial observations were confirmed two days later, January 15, when we asked an experienced receiver engineer, Les Fowler, from the RCA Victor division to visit Goldman. We told him to bring all his own test equipment and particularly stressed any test that would detect an internal battery. Fowler was unable to find anything wrong. He measured the local-oscillator radiation (normal) and any decay in output with time (none in three hours). He also measured the input current vs. line voltage (it went as the 5/4 power at low voltage and as the 5/2 power above 80 volts). He banged the set to detect any microphonics (none). The only unusual effect he noticed was that the input power went down slightly on modulation peaks, i. e., a loud sound decreased the input. All in all, Fowler was impressed.

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* A standard "All-American Five" AC-DC set - see Sams' Set 4, Folder 30. - Ed.

THE PROPOSAL

Goldman stated that there was a patent application under way to the U. S. Patent Office. He was positive that he was the first inventor, that no prior art was known, and that his invention would be completely covered and protected by patents. At no time during the test or the conversation did he give any hint as to what the invention consisted of or how it operated. He said he could also change over a television set but his business backers were unwilling to invest more money without some outside corporate interest.

The two Philadelphia businessmen who had originally contacted RCA were present throughout our visit. However, they seemed to have no technical expertise and contributed very little to the conversation. They did say that they had not seen the patent application, did not know the name of the patent attorney, had never seen the inside of the chassis, and were taking Goldman's word about the alleged facts of his invention.

The general idea was that, if RCA would pay one million dollars, only then would Goldman disclose his invention. There was considerable naïveté in such a proposal. RCA from its inception in 1919 was very sophisticated about inventions and patents. There was no way we would have bought a "pig in a poke" such as this. Nevertheless, if Goldman really had achieved what he claimed, it would have revolutionized RCA's entire business.

OUR REACTION

We had some anxious moments, and I spent the next few days on calculations on whether Goldman's results could be achieved with hidden filament-type tubes (instant warmup) and possibly some internal batteries. I concluded that it was possible, but I would have expected some detectable microphonics and we observed none. We just couldn't be sure. Even so, we rejected the proposal and sat back, nervously, to await the outcome.

We suspected that Goldman's demonstrations might have been made to other companies, possibly even the Bell Telephone group. One can imagine the reaction at Bell Telephone Laboratories, where the transistor invention had been made a few weeks before [4]. Of course, none of us knew this because it was kept secret until the announcement in July 1948.

We heard nothing more until months later when we learned that Goldman had disappeared and his business backers had concluded that the whole affair was a hoax. For us, in electron-device research, the announcement of the transistor came as a great relief; this revolutionary invention was made by "our own kind" - trained, knowledgeable, and using science as we had been taught - and not by a radio serviceman.

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2. Heil, Oskar, British Patent 439,437. Conv. date 3/2/34; issued 12/6/35.
3. Hilsch, R., and Pohl, R. W., "Control of Electron Currents with a 3-Electrode Crystal," *Zeits. f. Phys.*, Vol. 111, pp. 399-408, 1938.
4. One of the best accounts of the dates involved in the genesis of the transistor is in W. Shockley, "The Path to the Conception of the Junction Transistor," *IEEE Trans. E. D.*, Vol. ED-23, pp. 597-620, 1976. The official date for the first transistor is December 23, 1947, about three weeks before the event in this paper.

APPENDIX

It is possible to achieve the performance Goldman demonstrated (instant turn-on, 1.2-W audio output, 5-W power input) by use of 50-mA filament-type tubes and a selenium rectifier. For the output stage, five 3V4 pentodes would give 1.2 W of audio out with plate and screen-grid power of 4.2 W and filament power of 0.7 W. The three other tubes for converter, IF, and detector/audio amplifier would use one W for plates and screens and 0.2 W for filaments. The total for all eight tubes is 5.2 W for plates and screens and 0.9 W for filaments.

There are three reasons to suspect a hidden internal battery for the filament power (1.5 V @ 0.6 A or 3 V @ 0.3 A): [1] the unusual performance down to a line voltage of 30 V, [2] the suspicious double switching that I observed, and [3] the difficulty of dropping the line voltage down for the filaments without additional dissipation.

REPORT - IHRS-AWA SPRING MEET

The Kokomo IHRS-AWA spring meet was a good one! Thursday morning brought the largest attendance for the swap meet, which offered a large variety of items for sale. The afternoon and evening brought a trip to an art glass factory and a very good "Old Tyme" movie show by Pete Yanczer and John Jones. Friday morning's Restoration Seminar was well attended. The ladies enjoyed lunch and a program at noon. The afternoon program with Durward Kirby was the highlight of the meet. He entertained us again as banquet speaker Friday evening. Winners of the eight-category Old Equipment Contest were announced by contest chairman Herman Gross at the banquet. "Best of Show" and the Grebe Trophy went to Jim Thomas of Kokomo for his beautiful, well documented 1924 Flexo-dyne with a mint Metro Electric cone speaker on a floor stand. The Saturday morning auction was smaller than last year, but brought many good buys. Thanks to our hosts Don and Marilyn Johnston for their many hours of hard work. - **Ross Smith**

RARE BCL CARDS

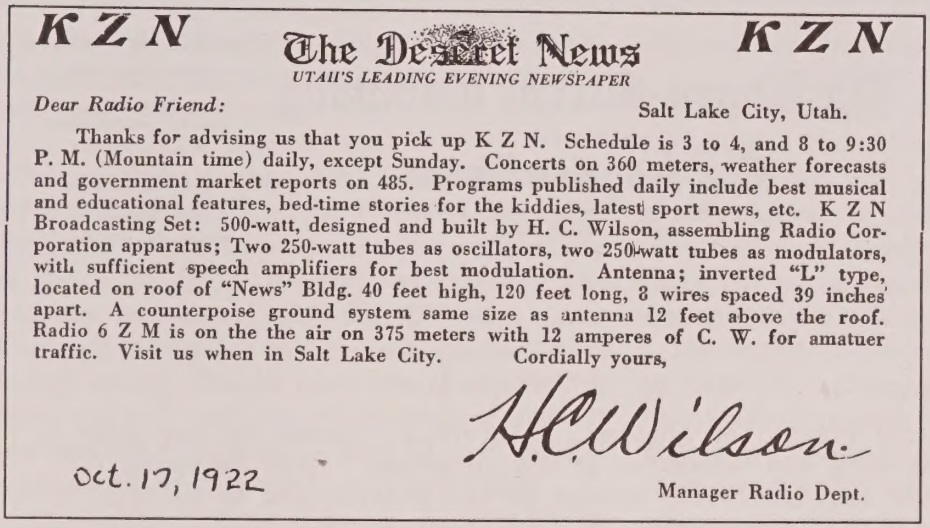
Bruce Kelley, W2ICE
59 Main St., Bloomfield, NY 14469

In the February *OTB* I gave examples of early amateur verification (QSL) cards. Now let's examine some cards from early broadcast stations. Broadcast listener (BCL) cards of the early '20s are rare, since few stations issued them and most of those have long since been discarded. The examples shown are from stations received between 1922 and 1924 by pioneer WHAM broadcast engineer Ken Gardner, W2BGN. Those were the days of two- and three-tube regenerative receivers powered by a couple of "B" batteries, with a car storage battery for the filaments. Can you picture Ken sitting in the wee hours of the morning with a pair of headphones clamped to his ears listening for DX?

The ultimate goal for the East Coast listener was to hear California. On October 17, 1922, Ken received KZN, Salt Lake City, which was using a couple of 250-watt tubes in parallel modulated by another pair. All transmitters of the early '20s were modulated oscillators.

Shortly afterward he realized his objective when he picked up KHJ and KGO in California and then the foreign station, "6KW" in Tuinucú, Cuba, on December 30, 1924.

You may be interested in 6KW. All components of the homebuilt station were manufactured by General Electric and listed in the then-current RCA-GE catalog. The station was rated at 100 watts using two UV-203 50-watters in parallel



K Z N — The Deseret News — K Z N
UTAH'S LEADING EVENING NEWSPAPER

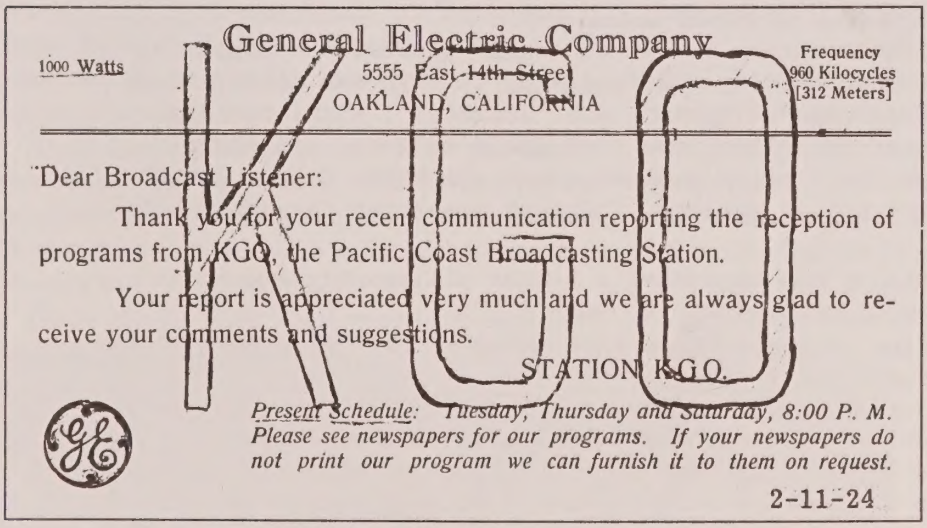
Dear Radio Friend: Salt Lake City, Utah.

Thanks for advising us that you pick up K Z N. Schedule is 3 to 4, and 8 to 9:30 P. M. (Mountain time) daily, except Sunday. Concerts on 360 meters, weather forecasts and government market reports on 485. Programs published daily include best musical and educational features, bed-time stories for the kiddies, latest sport news, etc. K Z N Broadcasting Set: 500-watt, designed and built by H. C. Wilson, assembling Radio Corporation apparatus; Two 250-watt tubes as oscillators, two 250-watt tubes as modulators, with sufficient speech amplifiers for best modulation. Antenna; inverted "L" type, located on roof of "News" Bldg. 40 feet high, 120 feet long, 3 wires spaced 39 inches apart. A counterpoise ground system same size as antenna 12 feet above the roof. Radio 6 Z M is on the the air on 375 meters with 12 amperes of C. W. for amatuer traffic. Visit us when in Salt Lake City. Cordially yours,

H. C. Wilson

Oct. 17, 1922

Manager Radio Dept.



1000 Watts

General Electric Company
5555 East 14th Street
OAKLAND, CALIFORNIA

Frequency 960 Kilocycles [312 Meters]

Dear Broadcast Listener:

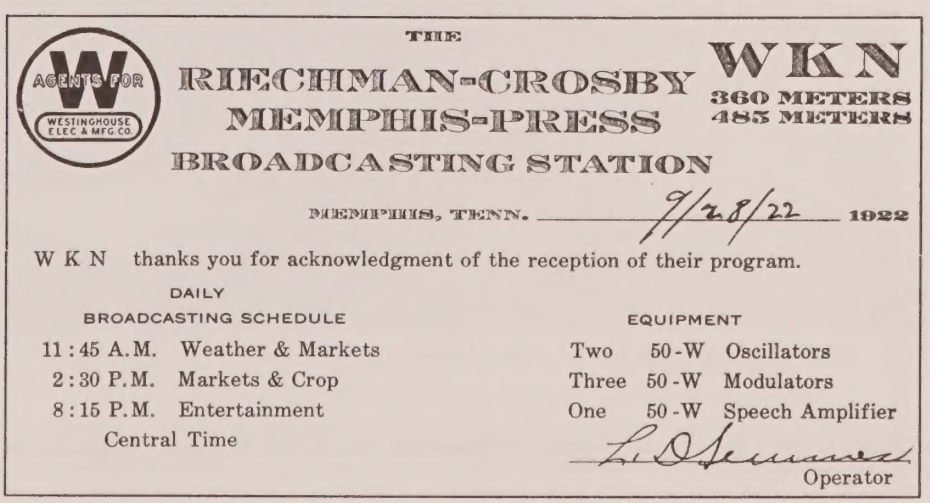
Thank you for your recent communication reporting the reception of programs from KGO, the Pacific Coast Broadcasting Station.

Your report is appreciated very much and we are always glad to receive your comments and suggestions.

STATION KGO.

Present Schedule: Tuesday, Thursday and Saturday, 8:00 P. M. Please see newspapers for our programs. If your newspapers do not print our program we can furnish it to them on request.

2-11-24



THE RIECHMAN-CROSBY MEMPHIS-PRESS BROADCASTING STATION

AGENTS FOR WESTINGHOUSE ELEC. & MFG. CO.

WKN
360 METERS
485 METERS

MEMPHIS, TENN. 9/28/22 1922

W K N thanks you for acknowledgment of the reception of their program.

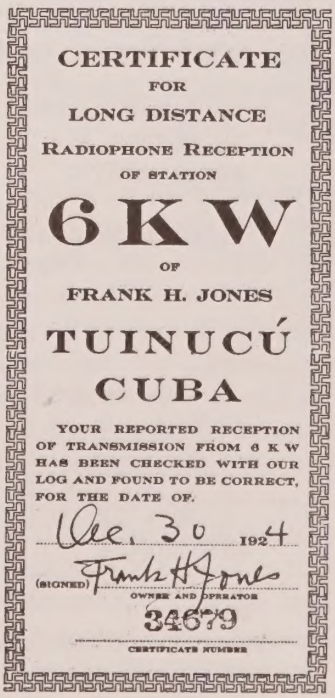
DAILY BROADCASTING SCHEDULE

11:45 A.M. Weather & Markets
2:30 P.M. Markets & Crop
8:15 P.M. Entertainment
Central Time

EQUIPMENT

Two 50-W Oscillators
Three 50-W Modulators
One 50-W Speech Amplifier

L. D. Semmes
Operator



CERTIFICATE
FOR
LONG DISTANCE
RADIOPHONE RECEPTION
OF STATION

6 K W

OF

FRANK H. JONES

TUINUCÚ
CUBA

YOUR REPORTED RECEPTION OF TRANSMISSION FROM 6 K W HAS BEEN CHECKED WITH OUR LOG AND FOUND TO BE CORRECT, FOR THE DATE OF.

Dec. 30 1924

(SIGNED) Frank H. Jones
OWNER AND OPERATOR

34679
CERTIFICATE NUMBER

modulated by a second pair. A third UV-203 was used as the speech amplifier with a WE 284-W carbon microphone. A 1000-volt generator supplied the plate voltage.

The antenna consisted of a six-wire cage five feet in diameter (!), 200 feet long, with a 125-foot, six-wire cage lead-in. Two 125-foot steel masts 300 feet apart supported the antenna. A counter-poise 35 feet above ground covered an area 250 by 400 feet. The station was owned by a colorful figure named Frank H. Jones, who was on the air every night except "Sometimes during the summer when nearby lightning storms make transmission dangerous or impossible."

WKN (Memphis) is a typical 1922 broadcast station on 360 meters. The Government assigned most broadcast stations to 360 or 485 meters (833.3 and 618.6 kHz respectively), although in time others could be heard anywhere from 220 to 550 meters. Try to imagine the squeals and heterodyning of several stations operating near the same wavelength, augmented by radiation from a neighbor's regenerative receiver. Fortunately, as noted on the cards, stations operated only a few hours a day. Thus, DX listening was possible when most local stations were off the air.

TIMES BUILDING
FIRST AND BROADWAY

OFFICE OF

The Times-Mirror Company

PUBLISHERS OF

Los Angeles Times

FOUNDED BY HARRISON GRAY OTIS, DECEMBER 4, 1881

LOS ANGELES, CAL.

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TREASURER
HARRY E. ANDREWS
ASSISTANT GENERAL MANAGER AND MANAGING EDITOR
MRS. MABEL OTIS-BOOTH

NOV 26 1923

K H J

Friend of Radioland:

KHJ, The Times, Los Angeles, California, thanks you for your communication regarding the reception of our programs. Your appreciation, as one of the vast audience, brings to the artists and to us the satisfaction of knowing that some measure of happiness has come to you through this new channel of human endeavor.

Our little canary birds are named "Kindness", "Happiness", and "Joy", and we are striving indefatigably to have our call letters also stand for "Knowledge", "Humor", and "Judgment"; Knowledge disseminated through crisp, clean news from world centers, and educational matter from the lips of men and women who know; Humor gleaned from the literature of all nations; Judgment developed through knowledge of values.

KHJ has as its objective a better citizenship and the general well-being of mankind.

You, the listener-in, are an integral part of our standard. Constructive criticism is invited.

We request your moral support along lines which will maintain radio broadcast as an American institution, non-political, non-sectarian and non-commercial, untrammeled by private monopoly and personal graft. Its success or failure will pivot on these principles.

Do not take radio as a toy but make it a part of your daily life along clean, consistent lines. Seek the best and be loyal to it.

Write us again.

Very sincerely yours,

John L. Daggett

"Uncle John"
Manager Times Radio Department.

Schedule:
12:30 — 1:15 P. M.
2:30 — 3:30 P. M.
6:45 — 7:30 P. M.
8:00 - 12:00 P. M.
395 Meters

P. S. We are glad to confirm your report of reception of our program.

D-R

Southern California is America's ideal Summer as well as Winter Resort. Average mean temperature, June, 66; July, 70; August, 71; September, 69.

WINGS OVER THE PACIFIC

Ronald R. Thomas, W8QYR
P. O. Box 347115, Atlanta, GA 30334

The bell sounded and the crew lined up and marched smartly onto the boat. It was time to prepare this great ship for the 8210-mile journey across the vast Pacific Ocean. Only this was no ordinary vessel, it was a Martin M-130 flying boat.

It was 1937 and an airplane trip across the Pacific was a great and expensive adventure. A key member of the crew who made the journey possible was the radio operator, often called a flight radio officer (FRO). He is a forgotten figure in the pages of radio and aviation history. It is his story that we are about to relive.

THE AIRLINE

Pan American Airways (PAA) made possible the aerial conquest of the Pacific Ocean. Often called Pan Am, the airline opened its transpacific service in November 1935. The trip was expensive; the one-way fare from Alameda, California (near Oakland) to Manila was $799, or about $10,000 in today's money. Yet, for those who could afford it, flying was well worth the cost in terms of time. It was hardly a nonstop trip, taking six days, but still a great saver over the weeks required by ship.

The flight stopped at Honolulu, Midway Island, Wake Island, and Guam, finally landing at Manila. Some flights then continued to Hong Kong. This route was the best one to accommodate the flying range of the aircraft.

At all locations facilities had to be provided to service the airplanes, and to accommodate passengers overnight. Radio stations had to be built. Hard work was required to make such locations as Midway and Wake suitable.

Three Martin flying boats were used until 1939. Called a Clipper in honor of the fast transpacific sailing ships of the 1800s, the M-130 was a four-engine craft with a length of 91 feet, a wingspan of 130 feet, and a height of 25 feet. With a maximum gross take-off weight of 52,250 pounds, it cruised at a speed of 130 mph and had a range of 3200 statute miles. While it could seat 41 passengers, on the Pacific journey it might carry only six to 12 due to fuel requirements, particularly on the long Alameda-Honolulu leg.

THE RADIO EQUIPMENT

The radio gear was used for communications and navigation. The airplane crew had to be able to stay in contact with ground stations for routine communications or emergency purposes. In addition, over-water flying required radio navigation - there was no equivalent of the radio-range beam system that crossed the continental U. S.

The airplane carried two identical receivers built by PAMSCO, a Pan Am subsidiary. These were tuned-radio-frequency units with regenerative detectors and plug-in coils. They had two stages of resistance-coupled audio. Frequency range was approximately 200 to 16,440 kHz. Each obtained plate voltage from two 45-volt "B" batteries in series.

One receiver was connected, through a radio-frequency (RF) amplifier, to a Bellini-Tosi type direction-finding (DF) antenna. This consisted of a device called a goniometer connected to two fixed-frame inverted-"V" loop antennas. The goniometer consisted of two fixed field coils and a rotatable core coil. Each antenna fed a field coil, while the output of the rotatable coil drove the RF amplifier. Turning the rotatable coil produced DF bearing information, without rotating the antenna loops themselves.

When the DF system was not being used, the RF amplifier was switched off. The receiver was then connected to the fixed antenna and used as a communications set. This permitted two frequencies to be monitored simultaneously.

The fixed antenna was a 35- to 40-foot wire, from a mast atop the wing to the vertical tail fin. The second receiver was connected to the fixed or the trail-

Martin M-130 China Clipper over San Francisco Bay sometime in 1935-38. The Golden Gate Bridge is dimly visible at upper left, Alcatraz Island at upper right, and downtown San Francisco in the background. *Photo: Martin-Marietta Company*

ing-wire antenna. The latter consisted of 200 to 300 feet of wire, unreeled while in flight.

There were two identical 50-watt CW (Morse) transmitters, also built by PAMSCO, on the airplane. Both used plug-in coil-capacitor units and covered approximately the same frequency range as the receivers - including the calling and distress frequencies of 333 and 500 kHz. Master-oscillator power-amplifier (MOPA) circuitry was used. The plug-in coils were pre-tuned for specific frequencies and the transmitters were quite stable.

One transmitter was located at the radio officer's station, and connected to the fixed antenna. The other was in the tail section and was connected, with a minimum length of transmission line, to the trailing wire. Each transmitter received its B+ voltage from a dynamotor, a combined motor and generator, powered by the airplane's 12-volt electrical system.

The Pan Am ground sites used Western Electric model 14-As as primary transmitters. These had ten crystal channels and had been modified for CW operation; output power was a maximum of 450 watts. The operators could turn the transmitter on and off, change its frequency, and key it from either ground-receiver or DF sites. The secondary ground transmitter was an MOPA unit with an output power of about 100 watts, built by PAMSCO. The transmitting antennas were primarily half-wave doublets.

The ground receiving sites had receivers built by PAMSCO. These used plug-in coils and covered from 500 kHz to 25 MHz. They had a tuned input, a stage of RF amplification, a regenerative detector and one or two resistance-coupled audio stages. Receiving antennas were half-wave doublets.

The ground DF sites had a Pan Am version of the British Adcock high-frequency DF system. Most of the en-route radio navigational aid came as bearings from stations of this type located at the departure and destination terminals.

The operating room for the ground DF system was separated quite some distance from the main radio operating room at the receiving site, but it controlled the same transmitters and used the same callsign. Ordinarily, the flight radio officer communicated with the ground operator at the main operating room and the DF operator just monitored. However, if the radio officer on the aircraft called for a bearing, the ground DF operator would respond.

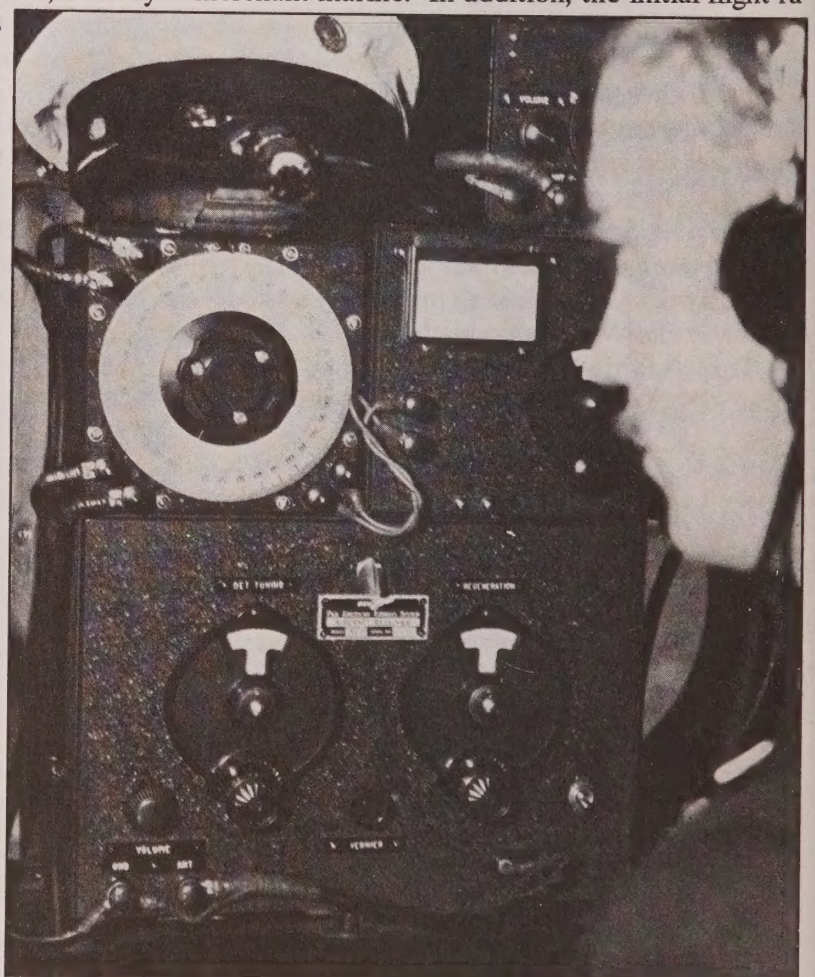
THE RADIO OFFICER

The radio officer was needed because in this era the only reliable long-distance communication from an airplane was via Morse code. In addition to providing communications, he was also expected to repair, or to compensate for, any piece of radio equipment that might fail in flight. He had spare parts aboard for items most likely to fail, including vacuum tubes, relays, and switches. Also, he had to operate the radio navigation equipment, which required skill and resourcefulness.

The radio officer sat at his equipment station behind the copilot. Across the aisle was the navigator, and behind the radio officer sat the flight engineer. Thus, all the flight crew were in close proximity. In addition, an intercom system permitted easy communication among the crew stations.

The radio officer might have received initial training as an amateur operator or at a military or civilian radio school. He was required to possess at least a Second Class Radiotelegraph operator's license issued by the Federal Communications Commission. Later, there was a requirement for an Aircraft endorsement on that license.

Pan Am chose the best and most experienced radio operators as radio officers on transpacific flights. Most had served as radio officers in the merchant marine. In addition, the initial flight ra-



Radio position in a Clipper. Above, the DF goniometer and RF amplifier; below, the PAMSCO receiver.

dio officers had experience flying for Pan Am in its Eastern Division out of Miami.

When new and less experienced radio operators were hired, they first worked on ground-station duty for at least a year. During that period their performance was observed closely. At the end of the year, the men who wanted flight duty were selected for further evaluation, if their performance and temperment met the required standard. Those chosen were checked out by an experienced radio officer on several local flights. The men who passed those checks were selected for flight duty, and went alone on their first trans-Pacific flight as a radio officer.

The pay for a flight radio officer depended on his length of service; it averaged around $150 per month. When on flying status, with no Pan Am facilities available, he was reimbursed for food and lodging. The typical flight radio officer made six or seven round-trip flights to the Orient each year. The other times were taken up with test and training flights, and other activities.

THE JOURNEY

The Clipper departed from Alameda in the afternoon for the overnight trip to Honolulu. This leg took an average of 17 hours to complete. Wind direction and velocity had a major impact on flight duration.

Before each flight, the radio officer would obtain a list of the surface ships near the airplane's planned flight path. This list would include the ships' callsigns and positions, for use in contacting them in case of emergency.

After the engines were started and the mooring lines were cast off, the radio officer would notify the local Pan Am ground station that the airplane had left the dock. Once in the air, he would send the takeoff time, which became the official departure time for the flight.

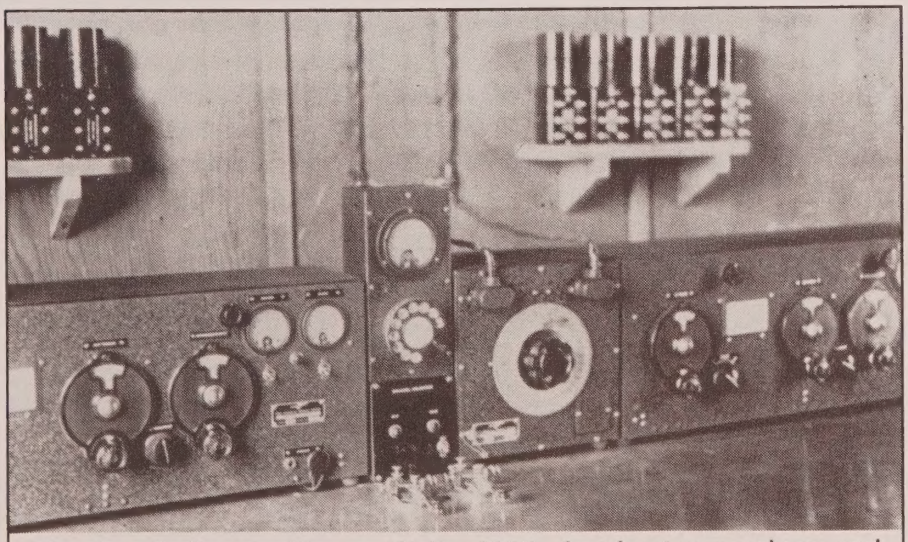
Initially, the fixed antenna was used for communication on a frequency of 1638 kHz. Once airborne, the radio officer would go to the rear of the airplane and reel out the trailing-wire antenna, to be used for most of the trip.

In addition, the radio officer would use his DF antenna to take bearings. He would also request bearings from the nearest Pan Am high-frequency DF stations to help the navigator maintain a course across the Pacific despite variable winds aloft and other uncertainties.

Actually, the aircraft DF was used mostly during the last hour or so of the flight to help the navigator make landfall at the intended location. In the case of the island sites, it was used to make certain that the navigator did not overfly the destination or pass on one side out of visual range. The aircraft DF would have been indispensable in getting to a surface vessel in case of a landing at sea.

The radio officer normally asked for a bearing from a Pan Am ground station about every half hour, 15 minutes before and after the hour. This information was

Operating position of station KNBI on Wake Island, 1935. Shown are two receivers. Between them are control boxes for the transmitters. The black box on the wall, above the transmitter controls, is the antenna patch panel to permit connecting any antenna to either receiver. The operators' licenses are posted on the wall, even though a surprise visit from the Radio Inspector was unlikely. *Photo: Almon Gray, W1KA*



Direction-finding position on Wake, 1935, showing two receivers and a goniometer. The transmitter controls are the same as at the receiving position. On the wall are plug-in coils for changing frequency bands in the DF receivers. *Photo: Almon Gray, W1KA*

given to the navigator, who plotted it on his chart.

Each hour on the hour, the radio officer would send a "long" position report, prepared by the navigator and pilot, to a Pan Am ground station. This report was sent in Morse at approximately 20 words per minute. It included position information, altitude, air speed, fuel remaining, weather, and related information. On the half hour, an abbreviated position report was sent. There were usually one or two incoming weather messages each hour.

The radio officer would normally maintain contact with the Pan Am departing location until about the halfway point of the flight leg. Then contact would be transferred to the destination ground station. During the flight the frequency would be changed from 1638 to 5165 kHz for more reliable communication. Other frequencies would be used as needed.

Airborne radio communication and navigation were as much an art as a science. Weather and atmospheric problems could make communication difficult. In addition, radio direction-finding, particularly over long distances, required significant skill and experience on the part of the operator to offset errors in the bearings.

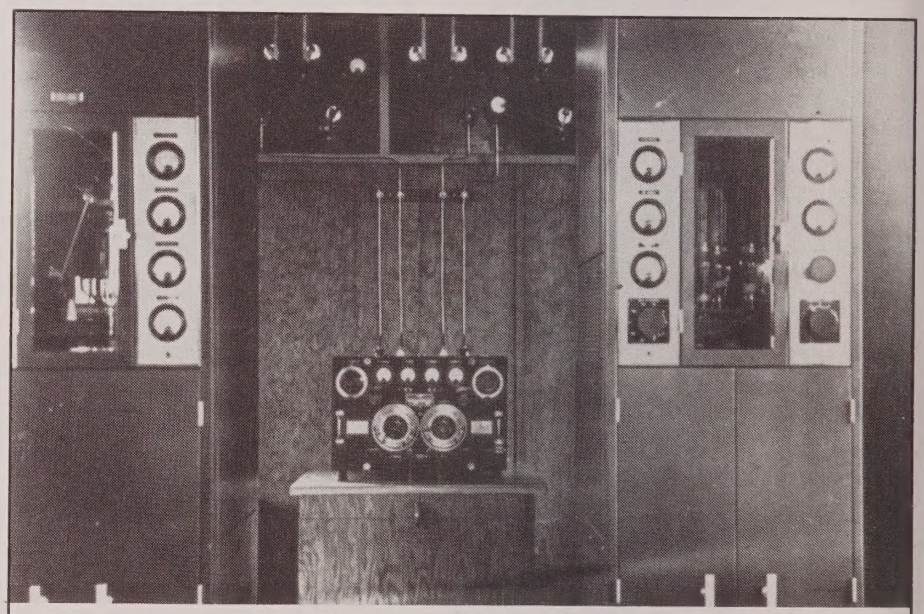
So, hour after hour, the radio officer would maintain contact with ground stations, and would perform the necessary DF activities. No matter how well rested he might have been, an all-night flight in a very noisy environment was exhausting. Weather or other factors could make the flight even more tiring.

For example, icing of the airplane could occur despite the pilot's efforts to avoid icing conditions. The limited deicing equipment would only throw alcohol on the propeller blades to break loose ice that might have accumulated. The Number Three propeller was only five or six feet away from the radio officer's position. When pieces of ice started coming off, they hit the side of the airplane about two feet from his head. The result was a rather disturbing noise.

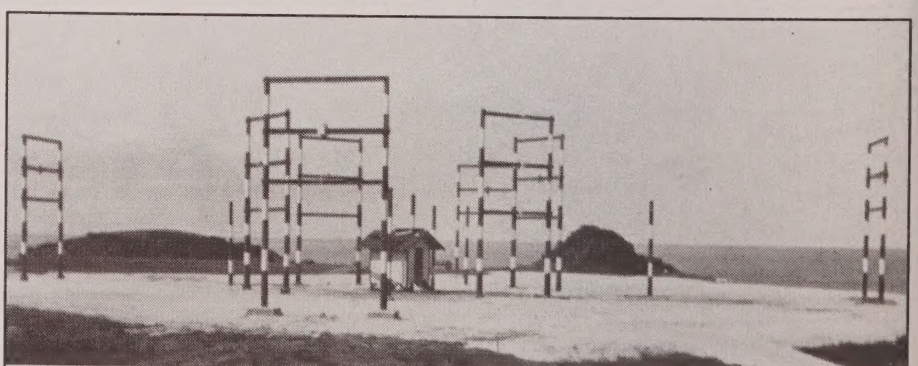
St. Elmo's fire was sometimes experienced on Clipper flights. It occurred because the aircraft would build up enough electrical charge to cause a corona discharge. Then, what appeared to be fire streamed back from every sharp projection on the exterior of the hull. There was a circle of light around each propeller, marking the arc of the propeller tips. Streamers trailed each wing tip and balls of fire seemed to run around the edges of the cockpit windows. Depending on conditions, this might go on for 10 or 15 minutes at a time.

The radio officer and the rest of the crew were always happy to see the sun come up, knowing that Honolulu was not far ahead. As the flight grew closer, the radio officer would start to take DF bearings and request them from the ground station in Honolulu, aiding the navigator in maintaining course for a landing at Pearl Harbor. The radio officer would switch back to 1638 kHz for communication into Honolulu. One of his final actions was to reel in the trailing-wire antenna.

With the craft safely tied up at the dock, the



Transmitters for KNBI, Wake, 1935. At left and right are the RF unit and power supply of the WE 14A - a 400-W AM-CW set with 10 preset channels selected by a telephone dial. It used a 251A tube in the final amplifier. At center, the PAMSCO-built secondary transmitter.
Photo: Almon Gray, W1KA



Direction-finder antennas and DF operating building at Hawaii, 1936.
Photo: Almon Gray, W1KA

ground crew took over. During this first layover of the journey, the flight crew was free to go to the hotel downtown and get some sleep in preparation for the next day's flight to Midway Island.

The aircraft remained overnight at Midway, then made a daylight trip to Wake Island. After another overnight stay, a day flight was made to Guam. The plane remained at Guam overnight and then flew in daylight to Manila, where many flights terminated. Flights continuing to Hong Kong operated in daylight.

On these flights, the radio officer followed the same communications and navigation procedures as on the Alameda-Honolulu leg. Since distances on the daylight flights were shorter, they were somewhat less strenuous. However, they could be equally challenging.

At the destination there was a one-day layover. Then a new group of passengers came on board for the return trip to Honolulu or Alameda.

For the passengers, a trip across the Pacific was usually a pleasant journey. However, for the crew it was a tiring experience. Despite the best of maintenance, mechanical difficulties would occur. Weather could create significant problems. However, the experienced crews had an outstanding safety record over several years of flying. On the early flights, they received a great deal of public attention. They were celebrities, much like the early astronauts. At Honolulu in particular, there were always large crowds to see the Clippers land and take off.

THE END

A larger and faster flying boat, the Boeing 314, was placed in service on the Pacific route in 1939. However, World War II disrupted commercial flying over the Pacific Ocean, with Wake Island becoming unusable at the outset, and Guam and the Philippines also being captured by the Japanese shortly thereafter. After the war, faster land aircraft came into service, and the era of the flying boats was at an end.

The introduction of sophisticated voice radio communication and electronic navigation (radar, LORAN, and the like) finally eliminated the need for radio officers on commercial flights. This closed the era of the flight radio officer. Now remembered by only a few, it was an era in which many would like to have participated.

ACKNOWLEDGEMENT

Technical assistance for this article was provided by Almon A. Gray, W1KA, who flew as a Pan Am radio officer in the Pacific from 1935 to 1938. He went on to be Assistant Superintendent of Communications for Pan Am Pacific Operations.

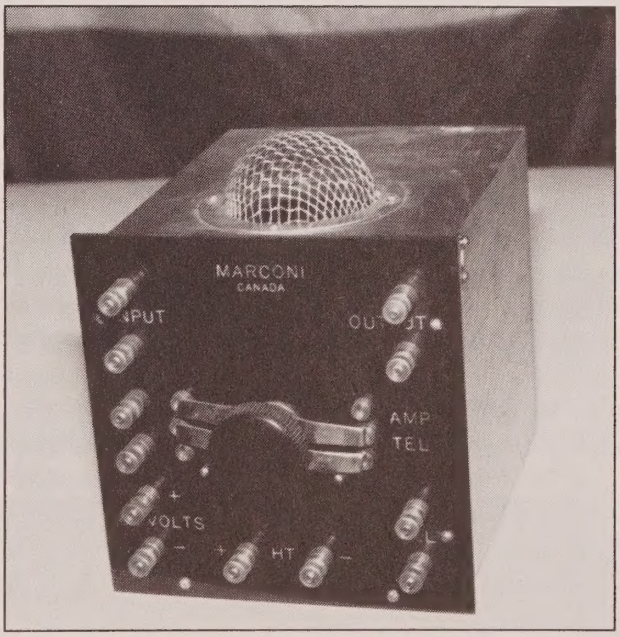
Ronald R. Thomas, W8QYR, is a telecommunications analyst in Atlanta. He has written over 100 articles and two books on telecommunications.

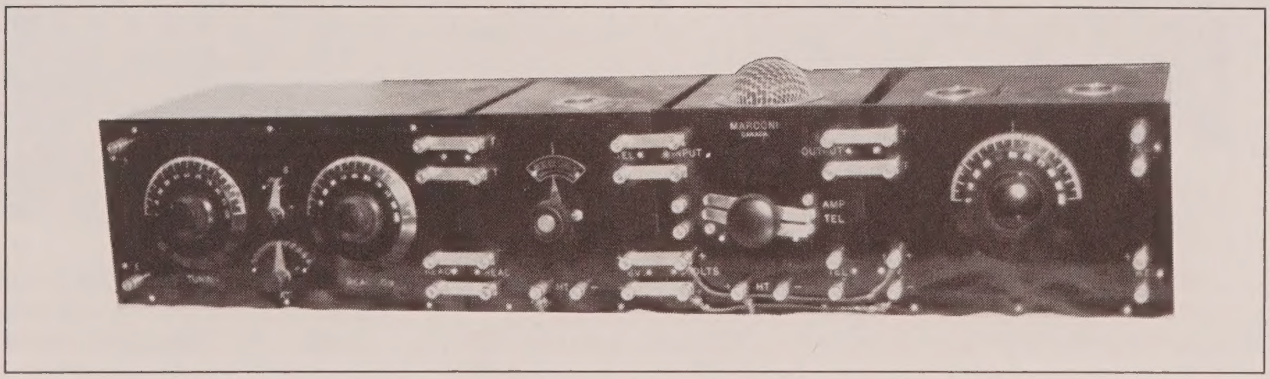
MORE ON THE "C" SET

H. K Fredrickson, VE5HF
218 Skeena Crescent
Saskatoon, Sask. S7K 4G8, Canada

In the August *OTB*, p. 22, is an article by Roger Hart on the Canadian Marconi Series "C" radio set. Roger mentions the P.A.1 set, a switched audio amplifier, and the fact that I have such a unit in my collection. Feeling that perhaps some of the members might be interested in seeing what a P.A.1 looks like, I'm enclosing a photo. The "tea strainer" is positioned right over the tube. The lower photo shows the four units hooked up exactly as I found them, there thus being three stages of audio amplification.

If there is someone else with such a unit, I'd appreciate hearing from him!





"ELEKTRIT" RADIO ENGINEERING COMPANY - VILNIUS, 1925-39

Henryk Berezowski and **Piotr Paskowski**
01-568 Warszawa, ul. Pogonowskiego 12 m. 2, Poland

The history of radio-making in Poland goes back to 1920, when the first wireless manufacturing companies were established (Farad and Radjopol). In 1923, the Polish Radio Association (Polskie Towarzystwo Radiotechniczne) was set up. In 1925 it established the first radio station broadcasting regular programs for the general public.

There were numerous radio manufacturers, both Polish and foreign, in the inter-war period, but the "Elektrit" company enjoyed a special position, in terms of both size and quality of its production. It was set up in 1925 in Vilnius (then a Polish city, today the capital of Lithuania). The company started off, as was often the case in those days, as a shop with an adjacent workshop. It expanded rapidly and by 1927 attained a manufacturing potential, allowing it to go into production of its own sets. The receivers enjoyed a reputation for quality of design and workmanship, and in fact the sets won gold medals at Paris and Florence exhibitions in 1927. The company continued to develop, diverging into production of sub-assemblies and parts. In 1935, "Elektrit" bought a license from "Minerwa," a Vienna-based company, and built a new production plant. It was by then a big and modern factory with 10,300 square meters of floor space, having its own power plant, joinery, machine shop and component-production division, as well as its own research laboratory. Production was done on an assembly-line (and also seasonal) basis, with five or six lines operating from September till March. By 1936, with a work force of 1100, the company was making 54,000 sets annually, worth 6.4 million zlotys (about $1.2 million). About 70% of the components were made on-site; tubes were supplied by the Warsaw branch of Philips. The sets produced ranged from the simplest single-circuit, three-tube receivers costing about 200 zlotys (≈ $37.50) to big, luxurious multi-circuit, multi-tube superheterodynes equipped with automatic tuning and other extras, priced at over 1000 zlotys (≈ $188). A new product line was prepared for every season. Thus, for the '36-'37 season, a collection of seven types in 15 models was on offer; for '37-'38, six types in 15 models, and for '38-'39, nine types in 18 models.

"Elektrit" was undoubtedly among the leading radio makers, besides the Polish subsidiaries of Philips and Telefunken, competing with the latter for a share of the quality-set market. The company was the only Polish firm able to compete in international markets, exporting sets from 1937 onward to many European countries, as well as the British Indies, South Africa, and Brazil.

The company was owned by the Chwalesow brothers (Samuel and Hirsz) and Nachman Lewin; the labor force was also mostly of Jewish extraction. This unfortunately led to the company being boycotted on the home market in the later years.

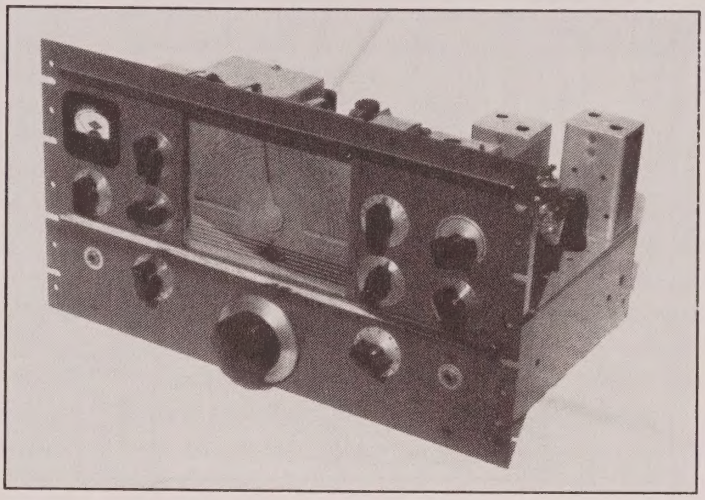
After the outbreak of the Second World War, Vilnius was occupied by the Soviet Army (September, 1939). The entire plant, together with its work force, was hastily moved to Minsk (today in Byelorussia) because Vilnius was soon to be handed over to Lithuania. There, in 1940, the Polish staff managed to resume production of "Elektrit"-based sets using Soviet-made tubes produced under U. S. license. Production was again halted by the Nazi invasion of the Soviet Union in 1941. Finally, in 1946, the firm began assembling sets once again. These were Soviet "Minsk" receivers - bearing an uncanny resemblance to the "Elektrit" sets of old. No history of the company has yet been written, since many aspects of its turbulent past, especially relating to its "changing countries," were taboo subjects in official history until recently.

Left: the Stentor model, 1936-37, an AC-powered five-tube three-circuit regenerative receiver with three bands. Right: the Largo, 1936-37, a six-tube, seven-circuit superhet with three bands, AVC, and tone control.

The Victoria model, a six-tube (4+2), seven-circuit superhet with three bands, AVC, and tone control.

A WORLD WAR II RELIC REVISITED - NATIONAL'S NC-200

Bob Haworth, W2PUA
112 Tilford Rd., Somerdale, NJ 08083



Many will remember how the U. S. government, at the outbreak of WW II, scrambled to purchase commercially manufactured radio gear from any and all sources. It was not unusual for them to buy a complete prewar amateur station, sending trucks and men to pick up receivers, transmitters and a multiplicity of other gear. To complement these purchases, the government procuring agencies turned their attention to equipment that was currently in production by such well known makers as Hallicrafters, National and Hammarlund.

At the time, the National Company had a series of fine all-band receivers, a "natural" for these procurements. Such receivers as the NC-100, the NC-200, and the venerable HRO series were ready to assist the war effort.

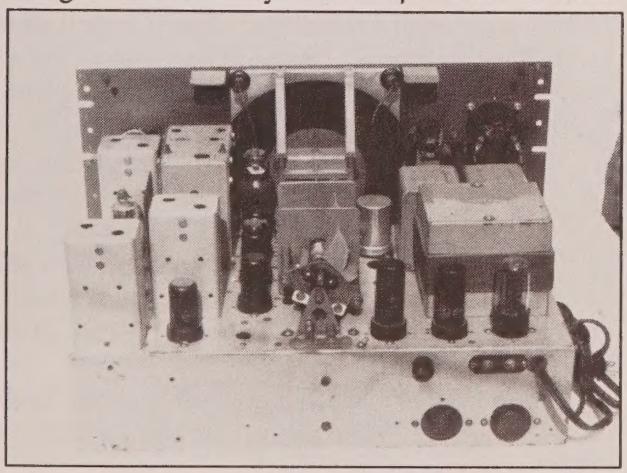
The NC-200 had gone into production in late 1940, with good acceptance by the amateur community. One reason for this popularity was the feature of full 180° bandspread on the main tuning dial for the 80-, 40-, 20-, and 10-meter bands. The 160-m band was direct dial-calibrated. Other features included a crystal filter, noise limiter and calibrated S-meter. The receiver was offered as the NC-200 TG (table model in two-tone gray wrinkle enamel), with optional matching NC-2 TS 10" speaker; the NC-200 TGM (a -TG without amateur bandspread); and the NC-200 RG rack-mounted model in plain gray wrinkle, with NC-2 RS 10" speaker.

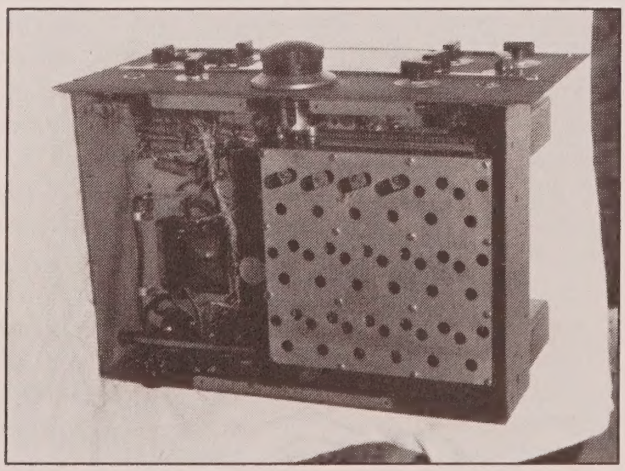
At the outbreak of the war, of course, to expedite delivery of equipment to the military, few changes were incorporated into these purchases. Thus receivers bought in 1942 (and probably into early 1943) had most of the amateur niceties incorporated. Later, as equipments were designed or modified specifically for military use, such things as hermetically sealed capacitors and moisture-fungus proofing were incorporated, while amateur-related features disappeared.

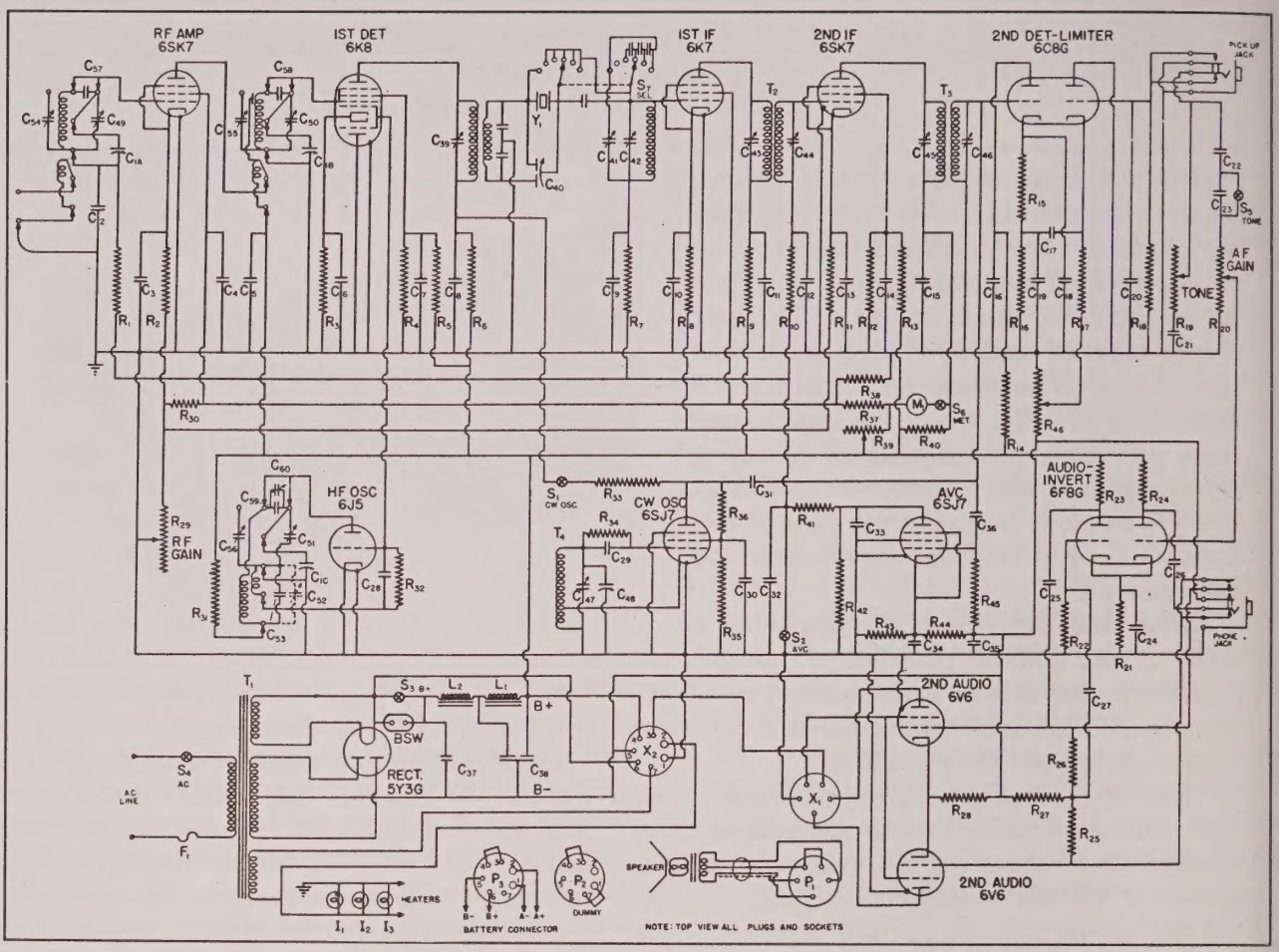
The NC-200 is truly a relic of the days of WW II, since its life cycle was only from 1940 to a last catalog appearance in 1945. An echo of the NC-200 was the NC-2-40C, -CS, and -D models, catalogued in 1946-48, with modest changes. The photos show the author's restored NC-200 RG (minus a rack cabinet, which I'm still pursuing).

The clean "National" lines and layout are evident. This receiver, basically an update of the NC-100/101 family, uses a single-conversion design (455 kHz) and includes such features as an RF stage, a mixer with separate oscillator, two IF stages, and the usual detector/noise limiter. There is a separate amplifier for the automatic volume control, with a claimed ability to hold the audio output constant within 2 dB despite changes of input signal as wide as 80 dB (from 10 to 100,000 μV). Since the emphasis in the '37-'41 time period was on providing a "high" audio output, the unit includes a phono input and uses push-pull 6V6s to provide eight watts of audio (if the operator's ears could stand that level).

The IF section incorporates a five-position crys-







tal filter, while a heavy-duty power supply with two-choke filtering was included on the chassis.

Perhaps the most unique feature of the NC-200 is the flywheel-tuning and band-changing system. This system, a legacy of that electromechanical design genius James Millen and his team, combined band-changing, selection of the bandspread function, and general-coverage tuning - all with one knob. According to a National ad in *QST* (Sept. 1940), other designers were Jack Ivers, W1HSV, and Dana Bacon, W1BZR (electrical); and Bill Larkin (mechanical).

When the main tuning knob is pulled outward approximately ¼", the knob is disengaged from the general tuning position and may be rotated to provide band changing and bandspread. A rotation of approximately one turn brings in the next band (an indication of the band selected appears on the dial), while an additional ¼ turn of the knob provides the bandspread function for the selected amateur band. Push the knob back in and normal tuning of the newly selected band is obtained.

This complex, and convenient, single-knob control was achieved using a gearing system and catacomb arrangement. The sliding-coil catacomb, like that of the NC-100, is a study in excellent RF design. It is constructed of an aluminum casting that resembles a honeycomb, except that the cells are rectangular. Each cell contains a subassembly of the coils, air trimmers and padder condensers required for the RF, mixer and oscillator circuits. Each cell provides shielding on all four sides of the tuning elements. When the bottom cover is in place, each is completely shielded.

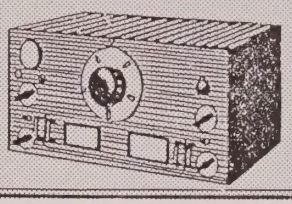
The bottom-view photo shows the catacomb with the cover in place, with the access holes for alignment. The catacomb is supported and moved laterally under the chassis on a large (≈ ½") support rod that runs the width of the radio. All electrical components are located close to the chassis, permitting the catacomb free access of the chassis width as it moves from side to side on the rack-and-pinion driver.

This arrangement and the fact that each tuned-circuit network is mounted on a phenolic molding that contains protruding dagger pins provides a wiping-type direct connection to the main tuning capacitor that is mounted rigidly on the chassis. Thus, an absolute minimum of lead length is involved for all bands. James Millen was a true genius of RF design. The system provides ten bands to cover the frequency range of 490 kHz to 30 MHz. In addition to the six standard medium and short wave bands, the four bands of amateur bandspread mentioned earlier are provided.

How does this restored radio function? In true National Company style, on-the-air tests reveal it is and has certainly provided many hours of listening enjoyment.

I often wonder if we will ever see a return to the solid design and construction that was embodied in these receivers of yesteryear.

THE COMMUNICATION RECEIVER



WRITTEN BY
WILLIAM B. FIZETTE, K3ZJW
RD 1, Box 55, Henryville, PA 18332
All correspondence requires SASE for reply.

A 1936 AMERICAN AIRLINES HRO COMMUNICATIONS RECEIVER

Always on the lookout for HRO receivers, including defunct models which can be used for repair parts, my eye was attracted to a rather disreputable rack model sitting on the ground in the flea market at the 1992 AWA Conference. It was greasy and dirty; the coilset, tubes, tube shields, dust cover, and bottom plate were missing; and it had been modified extensively. There was no meter or crystal filter, so it looked to be the remains of an HRO Junior. Nevertheless, it seemed to be good for parts, so for a modest sum I carried it off.

But one unique and interesting feature was obvious: The label riveted to the front panel stated that it was the property of American Airlines, Type AA HRO, Serial No. P44. I recalled that the HRO was created at the instigation of the airlines, and it seemed logical that this particular receiver would have been produced by National for use by the developing air-transport industry of the 1930s. A quick call to the seller, and a coilset matching the P44 serial number was located and shipped to me. Thoughts of using this receiver as a parts set quickly faded, and I resolved to "make it play."

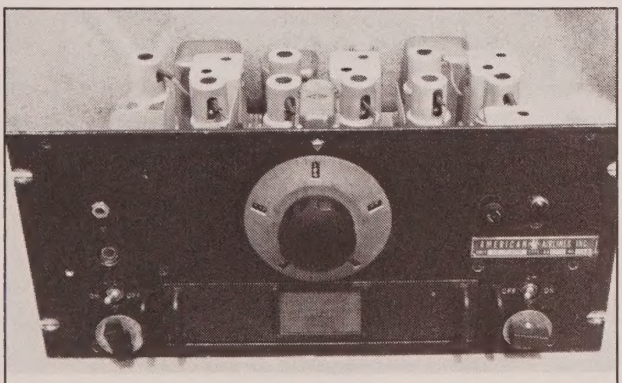
EVALUATION

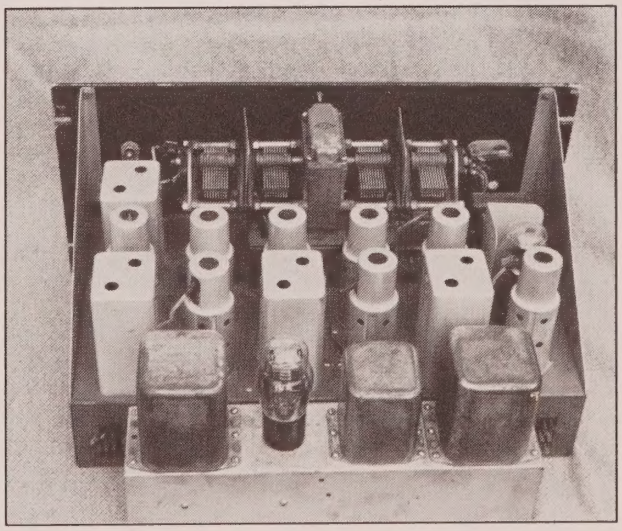
Easier said than done! The receiver had been modified extensively, probably in the American Airlines shops, after being shipped from National. The speaker terminals, the power cord, and the BSW terminals were removed and a customized power supply bolted to the rear apron. To carry the extra weight, two custom side brackets of galvanized sheet metal were added. The audio-gain control was also removed, the wires taped together, and a muting relay added underneath the chassis. A fuse was added to the front panel, and two Jones plugs to the rear apron. An audio output transformer was wired in, and the original BFO switch was removed and a DPDT switch substituted, complete with a custom-modified lever. I began to get the idea that the work was done by someone with definite ideas in mind, and that this was only one of several HROs so modified.

The serial number, P44, was checked against the information in Charles Fisher's article [1], and it was established that this receiver was built in 1936, probably in August or September. The style of the tuning dial, gray and with a single setscrew, was consistent with this dating. The tubes had been 2.5-V heater types, but AA changed them to their 6-volt equivalents, and marked the chassis accordingly. A 5Y4 was used as a rectifier.

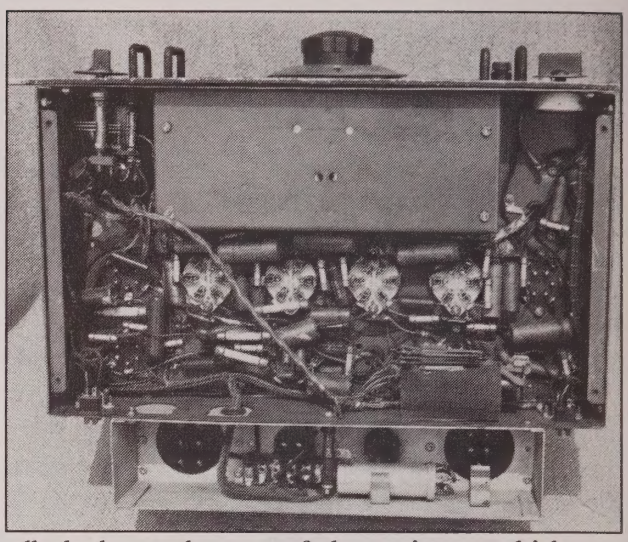
The coil was the "D" range, 1.7 to 4.0 MHz, which included the national calling and working frequency for aircraft of 3106 kHz [2] (later 3105). A single chartframe was affixed to the center of the coil face, similar that of to the HRO Jr. However, the presence of screw holes for two chart frames, coupled with the matching serial number, established this chassis as originally an HRO Sr.

There is another way of distinguishing an HRO Senior from a Junior in case of question. With the Junior a careful inspection of the front of the tuning-capacitor gang will reveal small aluminum tabs fixed to the stators. These were intended as ca-





Above: The American Airlines 1936 HRO. Right: Rear view of the receiver, showing the attached custom power supply and the two Jones plug interfaces.



Above: The AA identification plate on the front panel. Right: The underside of the receiver, showing the power supply and other modifications. The vintage white resistors and the muting relay are clearly visible.

pacity adjustments to fine-tune the circuit to match a common coil. The Senior did not have these tabs, each coil being matched to each receiver and having the serial number stamped on the side [3].

Underneath, the resistors were of the older type, white ceramic tubes with molded metal ends and with values stamped in blue ink. Some servicing had been done, with a few of the by-passes replaced by molded types of the late 1940s or early 50s.

The wiring changes were traced. The power supply was of a conventional capacitor-input variety, neatly built with high-quality parts. The relay was the telephone type, and it worked nicely at 12 VDC. The B+ switch was rewired as an AC power switch, in series with the front-panel fuse. One Jones plug had the two speaker leads and the 117 VAC power input, and the other the two antenna leads and a terminal for the relay power.

The relay, when activated, shorted the two antenna leads and disconnected the B+ to the audio output screen, effectively muting the receiver. Strangely enough, this circuit was run through one section of the new switch attached to the BFO capacitor, muting the receiver when the BFO was turned off. The other side of the switch controlled the B+ voltage to the BFO tube as usual.

RESTORATION

Since this was obviously a "utility" receiver, I gave it a utility 90-minute cleaning to remove the worst of the rust, dirt and grease. The front panel was removed, making the job much easier. The coil contacts were cleaned and particular attention given to the four-gang tuning capacitor. A matching Jones socket was located and the AC and speaker leads wired up. Tubes were obtained, and once the circuit changes were recorded and analyzed, the set was fired up using the usual precautions. The power supply held at 250 VDC, and it was found unnecessary to replace the by-passes or the electrolytics at this point.

And it worked, "as is," testifying to the design of a remarkable receiver! It did not work *well*, though, and if I had any idea of using it as a station receiver, the fixed capacitors, which are undoubtedly leaky, and many of the resistors, which are mostly out-of-spec, should be replaced. However, CHU on 3330 kHz came in clearly at the correct dial setting, and I had no trouble tuning in SSB, CW or AM signals on the 80-meter amateur band.

The audio output matched a high-impedance load, leading me to believe that the transformer AA used was intended for 600-ohm output to a line, typical of sets used at a remote receiver site.

DISCUSSION

My impression - or speculation, if you will - is that this receiver was one of a group ordered from National by American Airlines, with the specification that they be of high quality, but simplified, with no fancy accoutrements such as S-meters. Thus the solid front panel, making it resemble an HRO Jr. Then the sets were modified in the airline shop to render them easy to plug into and remove from a rack, with internal power and a simple two-plug interface for all connections. A major factor seemed to be to make the receiver as simple to operate as possible, with a power switch and only three controls - tuning, gain, and BFO. The AVC switch was probably left in the OFF position.

It is likely that this receiver was mounted with several others, set to frequency, and run continuously. If a set malfunctioned, it would be simple to remove and replace it with a similar module. The muting circuit could be disabled by simply disconnecting power to the relay.

However, the rationale for the muting circuit being wired into the BFO switch escapes me. Perhaps a former AA communications employee will come forth and explain this quirk, as well as tell us more of the story of how the receivers were used.

ACKNOWLEDGEMENT

Our thanks to Parker Heinemann, W1YG, the source of this receiver with the matching coil.

REFERENCES

1. Charles P. Fisher, "The HRO Report: Dating The Early HRO," AWA Review, Vol. 4, 1989, p. 35.
2. Myron F. Eddy, Aircraft Radio, 1931.
3. O. Eugene Sims (former National Company employee), personal communication, August, 1993.

LARKSPUR

Louis Meulstee, PA0PCR
28 Smetanalaan, 3122 HP Schiedam, Holland

INTRODUCTION

After World War II, the British Army changed virtually all its tactical short-range radios from HF amplitude modulation to VHF frequency modulation. This step was of major importance, both operationally and technically.

The technical side of this drastic modernization will be highlighted by illustration of the development of a group of equipments known as the Larkspur range. This equipment, whose development extended from the late '40s to the early '50s, has been used extensively by the armies of Britain, the Commonwealth countries, and a number of others.

Larkspur equipment is easily recognized by its thoroughly designed light-alloy cases and Plessey-type connectors. The sets are completely sealed - opening a set after 35-some years invariably shows a virtually new interior.

In comparison to the operationally similar AN/GRC-3 to -8 equipment developed in the U. S., the Larkspur equipment uses indirectly heated tubes. Larkspur circuitry was kept relatively simple by avoidance of bandswitching. The difficulty of designing a single set to cover 23 to 60 MHz, which would suit both the Royal Armoured Corps and the Royal Artillery, forced the designers to produce two similar models of the set.

The development policy at the time was based on known, reliable techniques, not making use of frequency multipliers or synthesizers, primarily to maintain simplicity and keep unwanted frequencies to a minimum. The need for frequent calibration was not considered a major drawback.

Maintenance is an easy job, as the principal Larkspur sets having a hinged main chassis reveal sub-chasses, any one of which can be quickly removed. A pre-aligned spare chassis allows field replacement without overall alignment.

Larkspur radios were normally used with a Wireless Control Harness, a system of distribution boxes, junction boxes, amplifiers and connecting cables. The standardization of this harness considerably simplified installations or changes in vehicles.

In 1961 the contraction WS (for Wireless Set, Station, or Sender), as a general indication for a complete radio station capable of being operated by itself, was superseded by SR (Station Radio). This notation has been used in this article except for those sets which were considered obsolete but still in limited use at the time (e. g., Wireless Set No. 88). The term "Transmitter-Receiver" (TR) is used for a transceiver or transmitter-receiver unit. It may include the power supply when this is an integral part.

VHF-FM

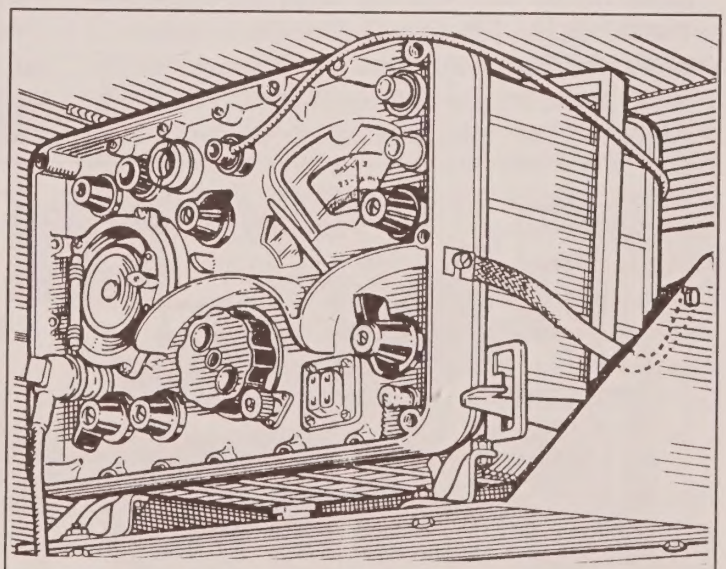
In the early stages of WW II, the advantages of VHF-FM over HF-AM in tactical radio communication became apparent. However, it was impractical to make such a far-reaching change in the British Army. The U. S. Signal Corps, not fully involved in the war until 1942 and thus being in a much better position, was able to change most of its tactical short-range radios to VHF-FM.

After the war the U. S. SCR-300 VHF-FM set (principal component, the BC-1000 transceiver) was adopted by the British as Wireless Set No. 31, complemented by WS No. 88. Both sets, the first British tactical VHF-FM radios, were introduced about 1948.

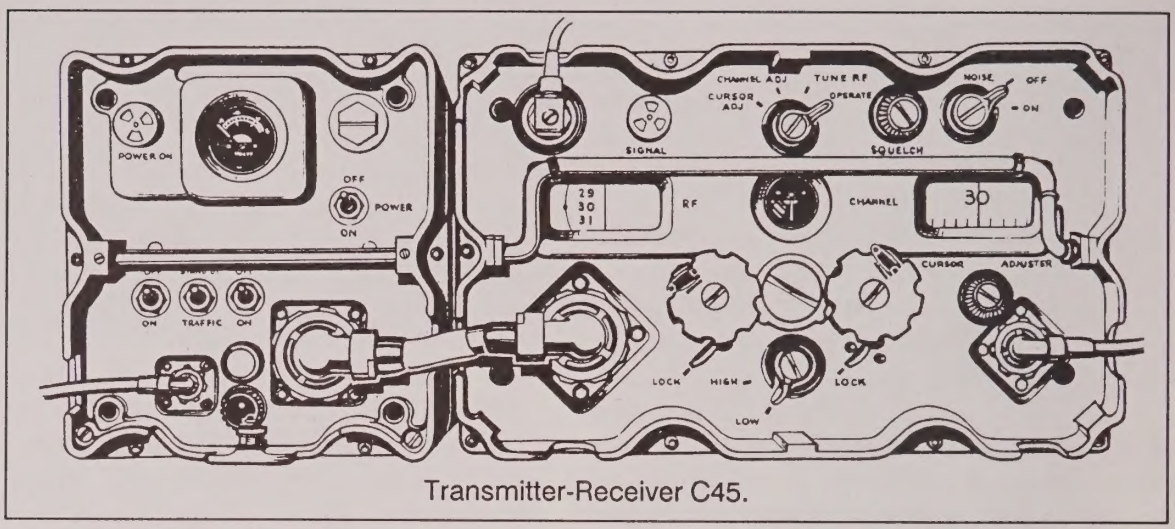
HERMETICALLY SEALED

Between 1955 and 1957 the radio equipment of all tanks and armoured vehicles of the Royal Armoured Corps (RAC) and Royal Artillery (RA) was exchanged for a new generation of VHF-FM sets. Both arms were allotted a frequency band ranging from 23 to 60 MHz, very similar to the signal allocation in the U. S. Army. The RAC (but later also Infantry, Royal Signals and other arms) operated at the "high" end of the band, 36-60 MHz. The RA operated at the "low" end of the band, 23-38 MHz, allowing an overlap of 2 MHz.

The design and mechanical arrangements of the sets were based on war-time developments of such



Larkspur equipment was based on wartime developments with hermetically sealed sets; e. g. WS No. 42, WS No. 88, and Reception Set R209 (pictured).



Transmitter-Receiver C45.

hermetically sealed equipment as Wireless Sets Nos. 42 and 88 and Reception Set R209.

TWO BASIC MODELS

The new generation of equipment was developed to replace WS No. 19. It consisted of two basic models. The "A" set, Station Radio C42 or C45, with a range of about 10 miles, was comparable to the "A" set of the No. 19 set. The short-range "B" set, Station Radio B47 or B48, was comparable to the No. 19 "B" set, primarily for inter-tank communication and supporting arms. Each model had two versions, differing mainly in frequency range.

Station Radio C42-C45. SR C42 was developed for radio communication in tanks and other vehicles. The station comprises transceiver TR C42 (including a crew-intercom amplifier), a power-supply unit and an Aerial Tuning Unit No. 6.

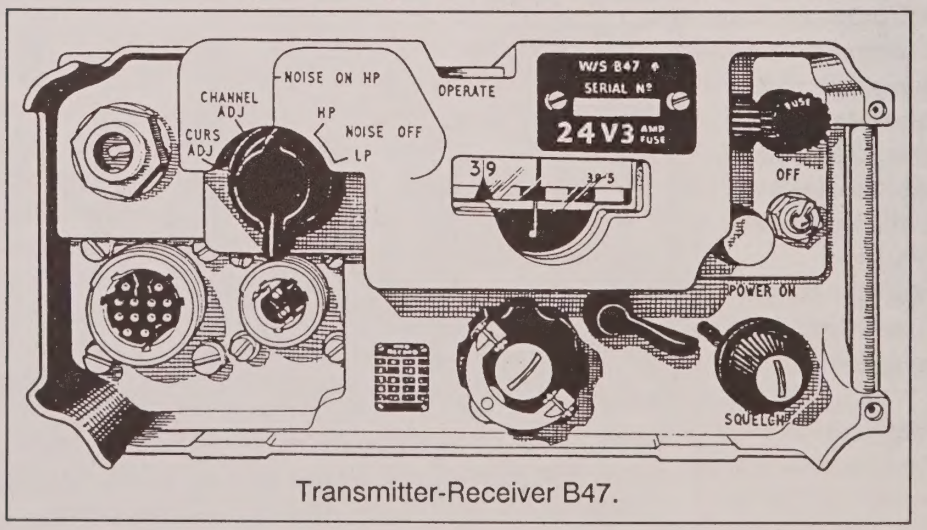
The frequency coverage is 36 to 60 MHz in 241 channels with 100-kHz spacing. A later version, SR C42 No. 2, provides 50-kHz channel spacing. The set has continuous tuning with a 12-ft film scale marked at every channel. An internal two-stage crystal calibrator and a zero-center tuning meter enable each channel to be set accurately. The RF output power is 15-20 watts, or about 0.5 watt in the "low-power" position. The standard vibrator power-supply unit runs from 12 or 24 volts, the 24-volt unit being in more general use. Units manufactured later used a transistor inverter.

SR C45 covers 23-38 MHz in 151 channels (100-kHz spacing), using an Aerial Tuning Unit No. 9, but is otherwise similar to SR C42.

Station Radio B47-B48. SR B47 was intended for communication between tanks and, for example, infantry equipped with corresponding man-pack equipment. B47 sets replaced Wireless Sets No. 31 AFV and No. 88 AFV. A complete station comprises Transmitter-Receiver B47 with internal vibrator power unit and Aerial Tuning Unit No. 8. It covers 38-56 MHz in 181 channels (100-kHz spacing). As with the C42/C45, the set has continuous tuning with a film scale marked at every channel, an internal two-stage calibrator, and a zero-center meter to set each channel accurately. The RF output is 0.5 watt, or about 0.01 watt at "low" power. The set operates on 24 volts, 12-volt units having been made on a very limited scale.

SR B48 has a frequency coverage of 26-38 MHz in 121 channels (100-kHz spacing). The Aerial Tuning Unit is a No. 10 model. It is in other respects similar to SR B47. It replaced Wireless Sets No. 31B AFV and No. 38 AFV.

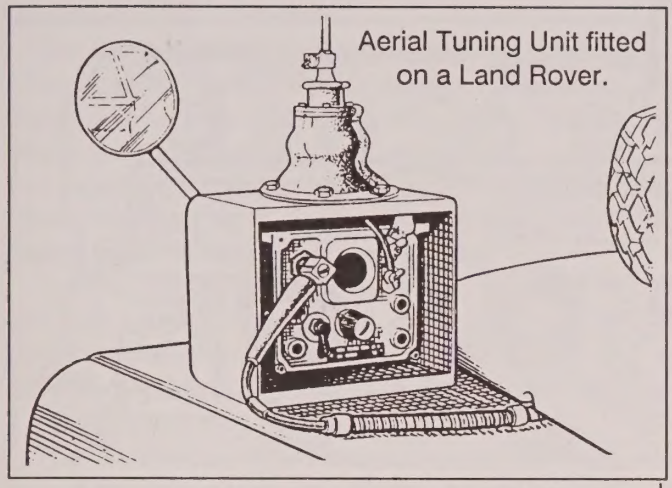
Aerial Tuning Unit. Both C42/C45 and B47/48 use a standard 8-ft vertical aerial. To match it to the set, an Aerial Tuning Unit (stores vocabulary TRFA, "Tuner Radio Frequency Antenna") is used. Each set has a different type of tuning unit, depending on frequency range and RF power. The Aerial Tuning Unit is mounted in a hermetically sealed die-cast case. This permits mounting, for example, on the vehicle's front wing directly below the aerial base.



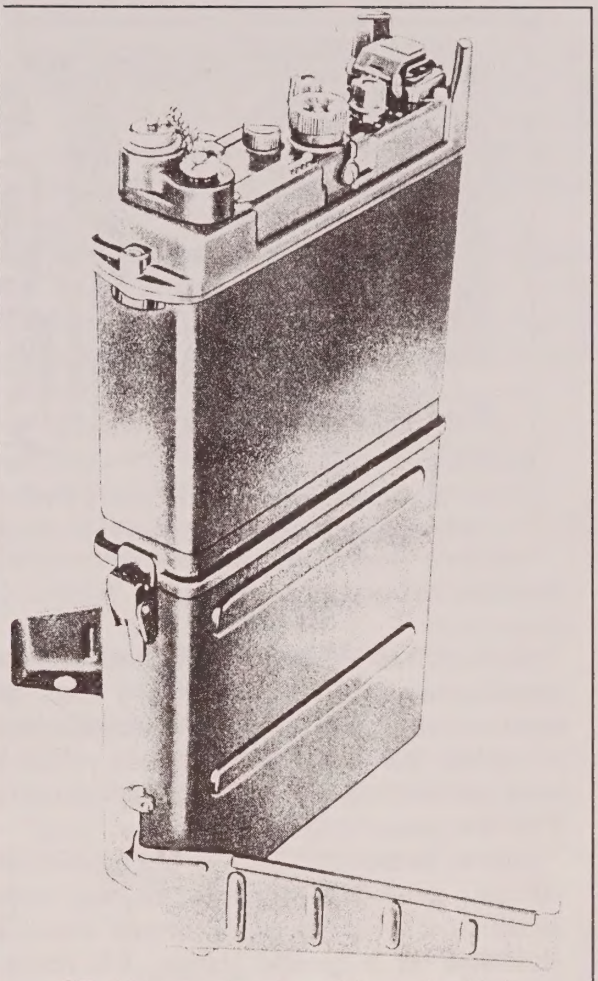
Transmitter-Receiver B47.

LARKSPUR

C42/C45 and B47/B48 equipment was initially supplied only to RA and



Aerial Tuning Unit fitted on a Land Rover.



SR A41 was developed from the U. S. AN/PRC-10 (RT-176). The A42 set, with different frequency range, was derived from the AN/PRC-9 (RT-175).

RAC. In the late '50s the issue of radio gear was investigated by the "All Arms Tactical Communications Committee." It soon became apparent that the sets had much value to other arms. However, no plan had been made for further issuance and production had almost stopped.

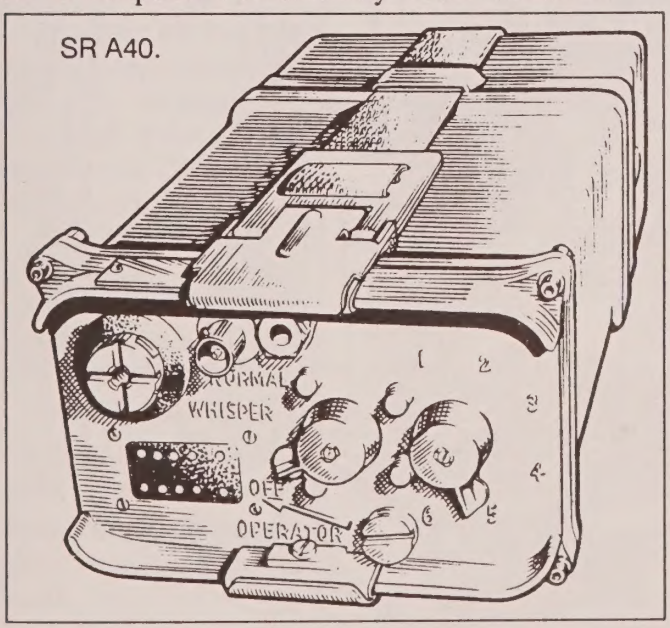
The committee gauged the possible needs of the entire Army for this radio equipment in a plan named Larkspur, the namesake of the group of sets. With expanded production, the sets were soon issued to other arms including Royal Signals.

As for the choice of name: in 1962, the year the program was launched, a horse named Larkspur running in the Derby races won at 22 to 1. This was considered a sign for what was bound to be a winning program! Larkspur equipment long remained in production: the manufacture of C42 No. 3 sets is recorded in India up to the '70s [1].

MAN-PACK SETS

Station Radio A40. SR A40 is a miniature man-pack radio with six preset channels between 47 and 55.4 MHz. However, many sets were equipped with a standard range of frequencies in an "A" and a "B" version, like those in the No. 88 set.

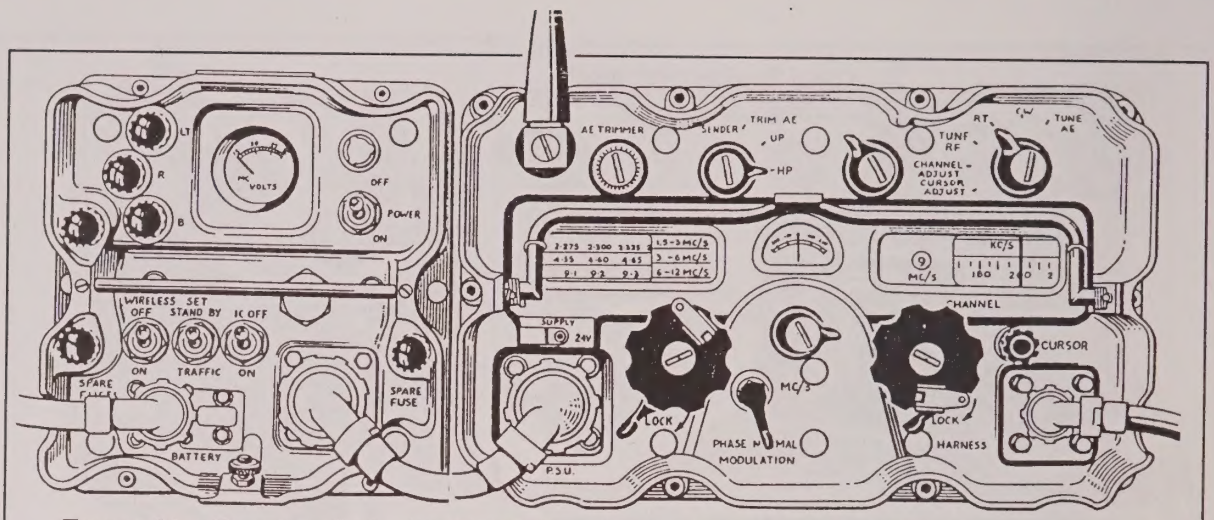
The A40 is adopted from the Canadian C/PRC-26. It comprises a hermetically sealed transceiver unit with battery compartment, an aerial and a number of accessories. The RF output is approximately 0.3 W. It operates from a combined 90/45/1.25/3-volt dry battery. The set was introduced in the late '50s for use within infantry companies and replaced WS No. 88.



SR A40.

Station Radio A41-A42. SR A41 was developed for communication with infantry and liaison to B47 sets in supporting armored vehicles. Introduced in the late '50s, it replaced WS No. 31. The frequency range is 38-55 MHz in 171 channels (100-kHz spacing). The RF output is approximately 0.75 watt. The set has continuous tuning with a film scale marked at every channel. The scale is calibrated to separately marked check points by a single-stage oscillator which is tuned for zero-beat in the headphones. In the early '60s a No. 2 version was introduced with 50-kHz channels, to work with C42 No. 2 sets.

Similar to Station Radio A41 is the SR A42, covering 26-38 MHz in 121 channels (100-kHz spacing). The set was introduced for communication for FOA (forward artillery observation) parties, working to SR B48, replacing Wireless



Transmitter-Receiver C13 with 24-volt Supply Unit No. 16. The C13 is often associated with the Larkspur series, having the same shape and approximate time of introduction.

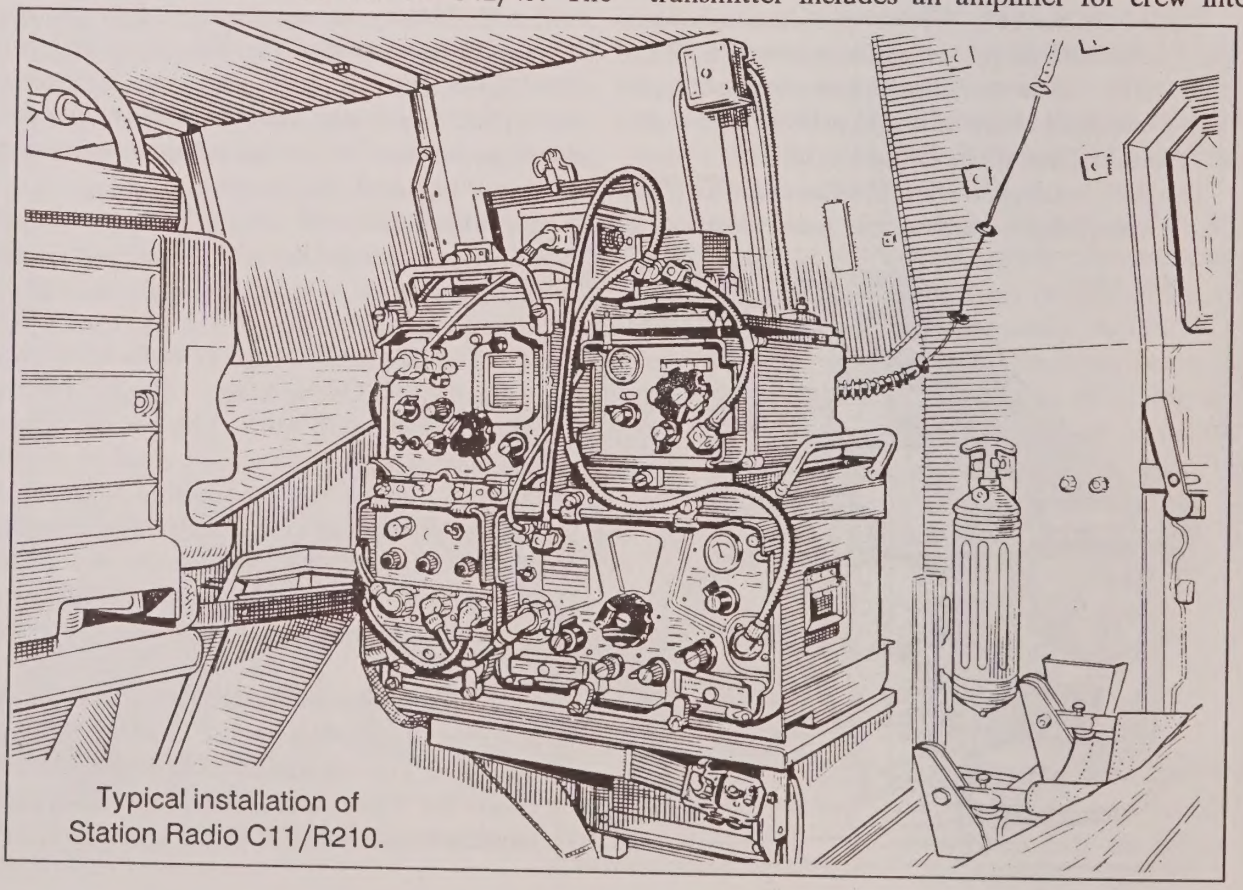
Sets Nos. 31B and 38.

HF RADIOS

Although VHF-FM offered many advantages for speech communication over relative short range, communication over longer distances still depended on HF. HF radios from the same period have been installed and used with the original Larkspur VHF-FM sets.

Station Radio C13. SR C13 is a medium-range HF set, developed primarily for rear communication for vehicular use in forward areas. It is also used as a ground station. It comprises Transmitter-Receiver C13, a 12- or 24-volt Power Supply Unit and a Tuner RF Antenna No 11. The set and power-supply dimensions are identical, and the front-panel layout and tune-up procedure are similar to those of the VHF-FM SR C42/45. The equipment provides voice communication using either amplitude or phase modulation, or CW telegraphy up to 20 WPM. The RF output on CW and PM is 20-30 watts, reduced to 10-15 watts with AM. The standard power supply operates on 24 volts, a limited number of 12-V units having been made. The set replaced WS No. 19 (High Power) and Station Radio C12.

Station Radio C11/R210. SR C11/R210 was developed for medium-range HF communication and was operated primarily by Royal Signals. A set comprised four units: Transmitter C11, Receiver R210, Power Supply Unit and Tuner RF Antenna No. 7. The set covers 2-16 MHz in three ranges and facilities are provided for AM speech, CW Morse and frequency-shift keying. The transmitter includes an amplifier for crew inter-



Typical installation of Station Radio C11/R210.

communication.

The RF output is 50 watts on high power and 5-10 watts on low power; the Transmitter and Power Supply Units are in light-alloy cases, cooled by fans which draw air through filters on the front panels and expel it through vents in the back of the cases. These openings have sealing covers which, when closed, make the equipment splashproof.

Two power-supply units are used, a 24-V DC unit and a 100-250 V AC unit. The AC unit also powers the R210 receiver. SR C11/R210 replaced WS No. 19 High Power and Canadian WS No. 52.

WIRELESS CONTROL HARNESS

The Wireless Control Harness is a versatile system of control units, junction boxes, amplifiers and connecting cables, designed for installing the Larkspur range radio equipment in virtually any vehicle. It provides control of several radios from various positions in a vehicle, including intercom facilities. Although primarily designed for vehicles, it is used in installations which have been dismounted and set up as ground stations. Two versions of the Wireless Control Harness are used: Type "A," mainly for tanks with two- or three-set radio installations; and Type "B," for other vehicles using only one or two sets.

A number of standard units, each having specific application and connected by standard cables, are used to make a particular harness, meeting the required type of installation.

RF AMPLIFIERS

In the Larkspur range a number of RF amplifiers were developed, driven by the RF output of a standard set and increasing its range.

Amplifier RF No. 7 is used in conjunction with SR C13, forming SR C13 High Power. The output with CW or PM is 200 watts.

Amplifier RF No. 9 is a universal amplifier, used with SR C11/-R210, delivering 1 kW CW or 400 W AM.

Amplifier RF No. 10 provides a power of 1 kW in the frequency range 23-60 MHz, applicable to SR C42 and C45.

POSTWAR EQUIPMENT NOMENCLATURE

The British nomenclature for wireless sets, dating back to 1929, was maintained until 1948. By then it had proven to have many limitations and incorrect designations. The postwar revised nomenclature avoided the drawbacks of the previous system.

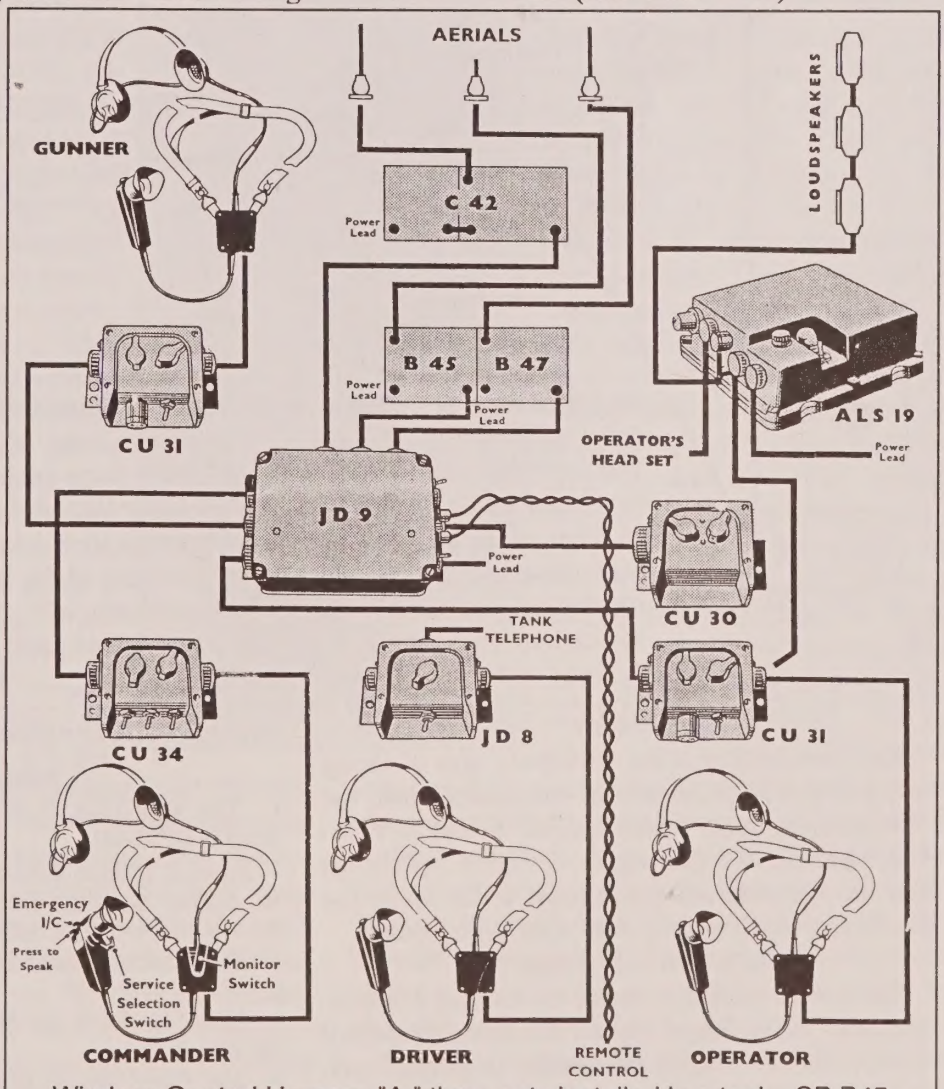
A set is given a letter followed by two figures. The letter indicates the total power input to the complete station. The figure indicates the part of the frequency spectrum in which the set operates and the chronological order of the set.

Total power input indicated by a letter:

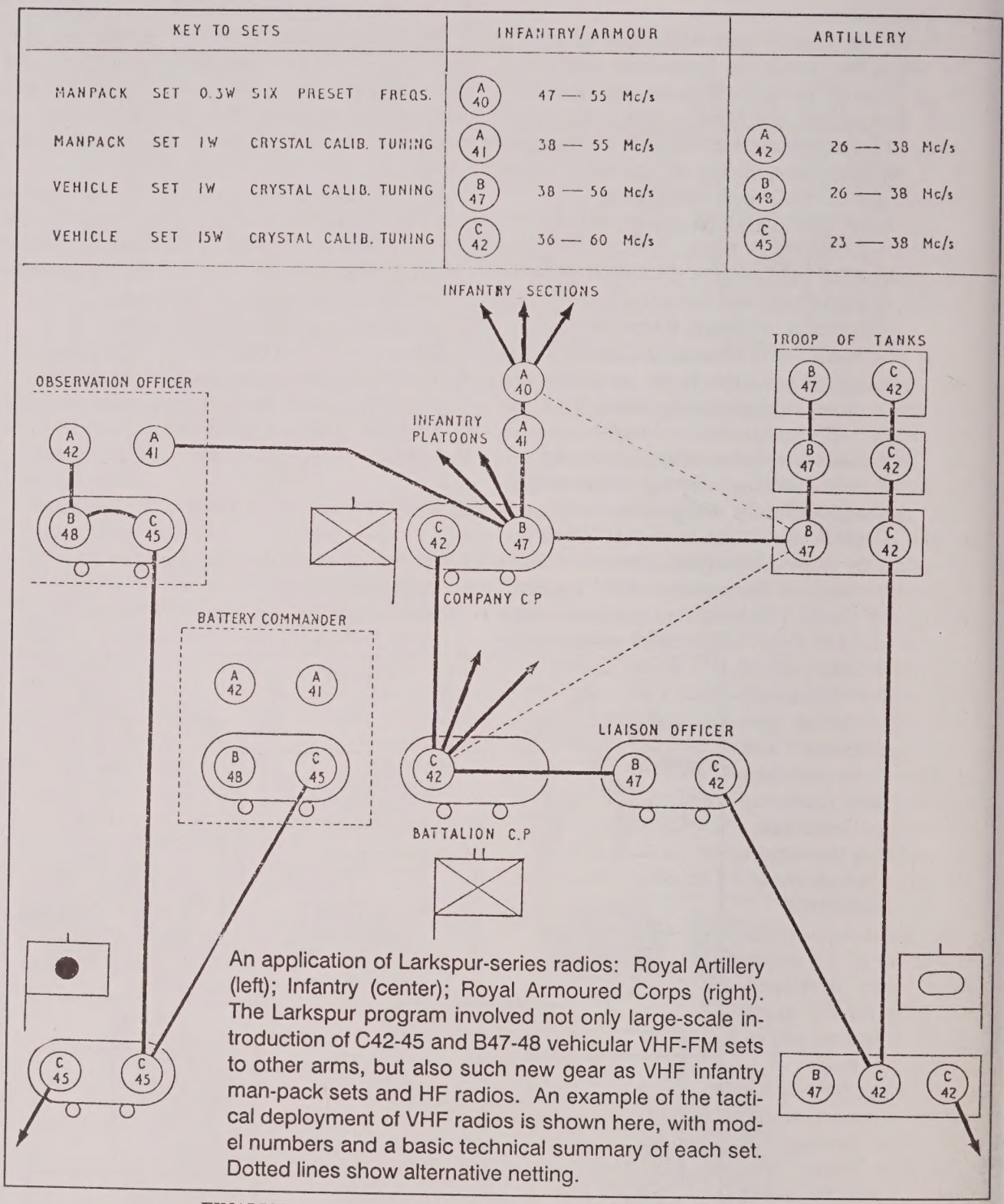
	Power	Type	Function
A	0-10 W	Dry-battery operated	Manpack
B	10-100 W	Low-Power sec. batt.	Man-portable
C	0.1-1 kW	Medium Power sets	Vehicle
D	1-10 kW	High-Power sets	Transportable/mobile
E	> 10 kW	Very High Power	Transportable/fixed

Frequency range indicated by figures:

10-39: 300 kHz-30 MHz (MF-HF band)
40-69: 30 MHz-3 GHz (VHF-SHF band)
70-99: > 3 GHz (SHF-EHF band)



Wireless Control Harness "A," three sets installed in a tank. SR B45 shown in this illustration never did reach the stage of production.



An application of Larkspur-series radios: Royal Artillery (left); Infantry (center); Royal Armoured Corps (right). The Larkspur program involved not only large-scale introduction of C42-45 and B47-48 vehicular VHF-FM sets to other arms, but also such new gear as VHF infantry man-pack sets and HF radios. An example of the tactical deployment of VHF radios is shown here, with model numbers and a basic technical summary of each set. Dotted lines show alternative netting.

FINALLY

The introduction of the Larkspur range of radios was a major step forward in comparison with the WW II equipment. It was not just the use of VHF-FM, but also the thoroughly designed equipment and the versatile control harness which made the Larkspur range of equipment a lasting success.

ACKNOWLEDGEMENTS

The author wishes to thank the Deputy Director and Staff of the Royal Signals Museum, Blandford Camp, Dorset, UK, for permission to publish various illustrations and for their help in preparing this article, which has been published previously in *Q-Five*, the Dutch-language newsletter of the International "Angry-Nine" Association.

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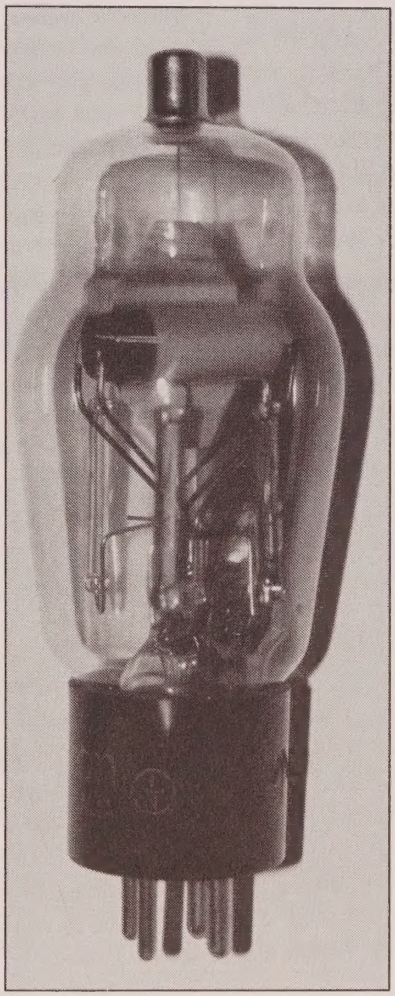
THE AWA AV11 RECTIFIER

Colin MacKinnon, VK2DYM
52 Mills Road, Glenhaven 2156, Australia

During WW II Australia was left in a desperate situation. Having relied on England for most of its defence needs in the past, it now found itself isolated and unable to obtain military equipment, components or raw materials for local manufacture. Australian industries hastily converted to war production and the wireless and electronics industry was generally able to satisfy needs for telephones, radio transmitters and receivers, etc. However, radar production which had commenced in 1940 after Australia was taken into the confidence of the UK scientists, looked like coming to a complete halt. Australian scientists of the Radiophysics Laboratory, or RPL, had obtained samples of the English ASV (Air-to-Surface-Vessel) Mk II radar set and were working to adapt it for ground use. This ASV radar used the VT90 triode in a push-pull oscillator, producing around 6 kW pulse output, but the RPL scientists wanted more power, around 10 KW, so they needed a high-voltage rectifier to provide the 10,000 volt high tension.



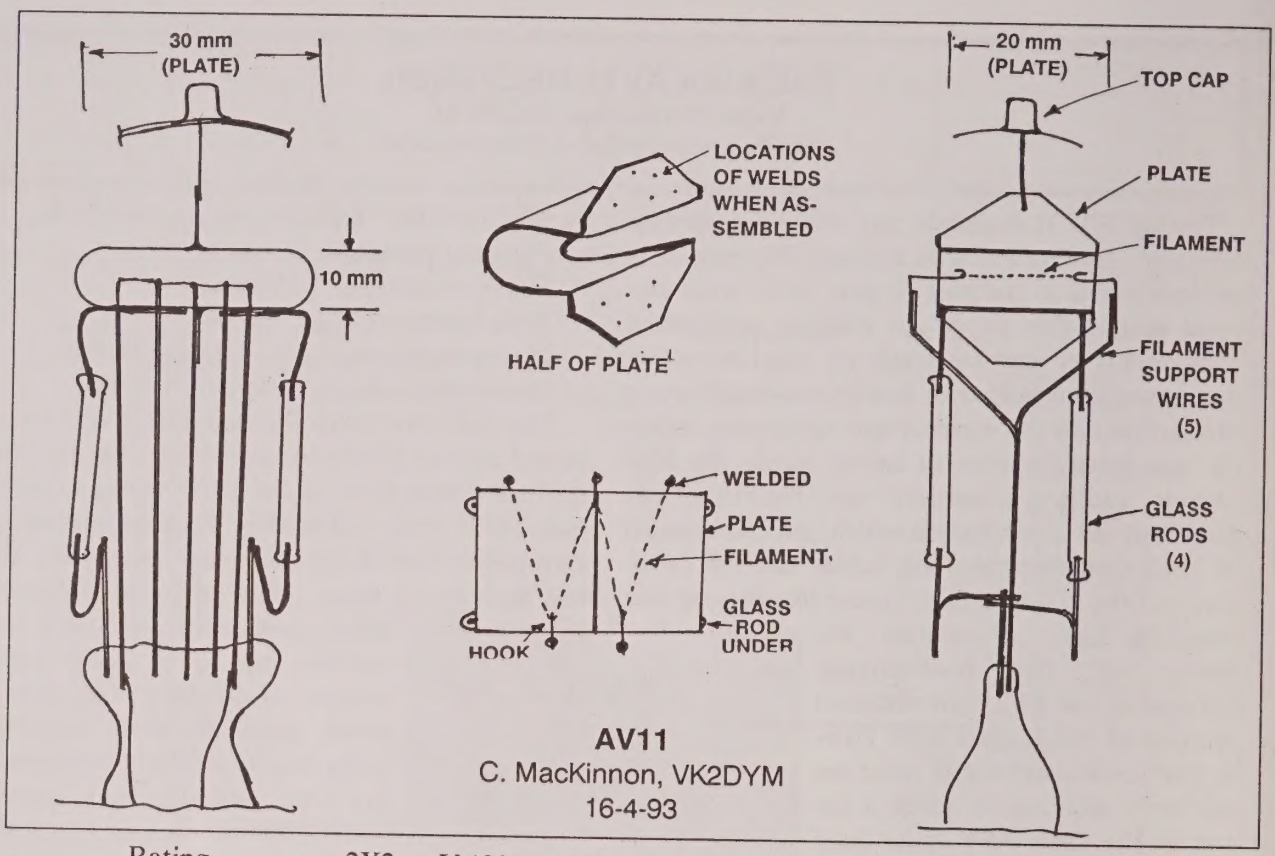
By December 1940 the supply of suitable imported rectifiers was exhausted, and urgent efforts were being made to obtain more. Philips, which had a manufacturing plant in Australia for domestic valves, thought it could get a suitable valve from its US factory, but only in very small quantities. STC (Standard Telephones and Cables) also had a valve plant in Australia but to this point it had made only amplifier valves for telephone repeaters. STC suggested the imported 4059A, but couldn't get any from its UK parent company. AWV (the Amalgamated Wireless Valve Co., a subsidiary of the Australian company, Amalgamated Wireless Australasia, had a large valve-manufacturing plant already making a range of receiving and transmitting valves based mostly on RCA designs, but it had not made high-voltage rectifiers before. Their best effort was a rectifier capable of 5000 volts at 60 mA and they refused to do any research work until they received a contract and priority order from the government.

An order was hastily arranged and AWV commenced development of the Type AV11 half-wave vacuum rectifier. Tentative ratings were to be:

Filament potential: 2.5 volts
Filament current: 1.75 amps
Peak inverse voltage: 14,500
Maximum average plate current: 30 mA
Maximum peak plate current: 350 mA

The first two valves submitted by AWV for approval proved less than successful. On test they showed a blue glow as the input voltage reached only 120 V RMS, followed by a sudden rush of current and failure of the filaments! Incredibly, they still had gas in them. The next submission was more productive and tests were possible up to a peak inverse voltage of 25,000 at 55 mA, at which point the valve showed a slight fluorescence at two spots in the tube, probably from electron bombardment. It was found that the filament had to be switched on first for about 30 seconds before applying HT, otherwise the valve was prone to destructive arc-over within the elements. These tests commenced in January 1941 and continued through to the end of February, at which time tentative specifications for production valves were issued. Initially the RPL wanted each valve to be tested at a PIV of 25,000 and 50 mA current for 5 minutes, without arc or glow, but AWV pointed out that such a test was like striking matches to prove they were acceptable. Therefore AWV was asked to guarantee 1000 hours operating life at ratings of 14,500 PIV and 30 mA max. average plate current, plus a test of 21,000 PIV at 40 mA for 5 minutes. The scientists suggested AWV could improve their manufacturing quality and in particular the degree and consistency of evacuation. To prevent switch-on failure a time-delay relay was fitted to the radar equipment allowing a 30-second filament warm-up before application of HT. Incidentally, the English ASV radar used a step switch with a caution to the operator to "Count five before switching to H.T."

To compare the AV11 with other valves, a series of tests were carried out on samples of RCA 2X2 (879) and Mazda V.1907 (military designation CV 1111) rectifiers. The relevant test results were:



AV11

C. MacKinnon, VK2DYM

16-4-93

Rating	2X2	V.1907	AV11
Filament voltage	2.5	4.0	2.5
Filament current (A)	1.75	1.1	1.75
AC plate voltage RMS	4500	5000	5000
Peak inverse voltage (kV)	12.5	12.0	12.5
Peak plate current (mA)	100	350	300
DC output current (mA)	7.5	50	30

Under test the 879 (the indirectly heated cathode version of the 2X2) withstood 26,000 PIV. After other severe tests it was noted that "examination shows the cathode to be practically destroyed. However, the valve is still capable of giving 7.5 mA at 3000 V with an ac input voltage of 2700 V RMS." In these tests the scientists had greatly exceeded the 10-kV ratings of their own test equipment so "thought it inadvisable to leave it on for more than 3 minutes."

Several of the V.1907s proved to be prone to flashover at around 17,000 volts at only 11 mA but other samples were able to give 8500 volts output at 12 mA and withstand a PIV of 18,700. Simultaneous switching of filament and HT was a guarantee of valve destruction!

In their summary the scientists noted:

The factor of safety against peak inverse flashover on the V.1907 seems to be somewhat less than that provided on the AWA valves type AV11, specially when we consider that the current drain, when tested, was well below the rating of 50 mA. The voltage drop across the valve at 30 mA drain is nearly the same as that appearing across the AV11.

It seems that the 2X2-879 has a rather greater factor of safety than the Australian made AV11. It is probable that this is largely due to the better evacuation of the American job. When the HT and filament voltages are applied simultaneously the glow appearing in the 879 is a light grey colour and that in the AV11 a bright blue, which seems to indicate a better vacuum in the former. Also due to its construction (a straight equipotential cathode surrounded by a concentric cylindrical anode) the 879 is a better tube to withstand very high peak inverse voltages than the AV11.

Physically, the AV11 is similar to the AWV-produced 807, and uses the same envelope and top cap. The base is the USM4 and is branded "Radiotronics." Internally, the filament is a horizontal "W" supported by five wires, the outer two of which are connected to base pins 1 and 4. The plate is a horizontal flattened cylinder supported on each corner by a glass rod, four in all. Wires inserted into each end of the glass rods connect them to the plate and to wires in the squeeze. The plate is made up of two U-shaped, flanged sheet pressings welded together. The top cap is connected to the top plate flange by a wire. The plate cylinder surrounds the filament, with a clearance of 5 mm. Refer to the photo and sketches above.

The AV11 was accepted for production and several thousand were produced during the war for a number of different designs of radar set, both ground and airborne.

Specifications of the AV11 do appear in Babani's International Radio Tube Encyclopedia of 1949, along with many other wartime valves which faded into obscurity.

References: Radiophysics Laboratory Reports RP57/1, RP72/1, RP72/2, RP72/3.

THE TUBES RCA DIDN'T TELL YOU ABOUT

Ludwell Sibley

In the early Thirties, several of the "independent" tube makers, that is, those not associated with RCA, brought out tubes of their own design under two-digit numbers. The 29 and 69 "Wunderlich" full-wave split-grid detectors* are perhaps the best known of these. The independent designs were low sellers or, like the Wunderlich device, involved special patent considerations. RCA did not see fit to make or distribute them, so one can search in vain to find them in any edition of the RCA receiving-tube manual.

These types are quite scarce - if one set out to collect the full range of two-digit tubes, it would be a while before they all turned up. For example, the 14 and 17 were used in DC line-operated radios which became useless when center-city power systems were converted to AC, so the sets and their tubes were discarded early. Likewise with the specialized tubes intended for early car radios, which tended to be junked with the cars.

Here are these unusual types:

14 - A five-pin amplifier tetrode in an S14 bulb with grid cap. ("S14" denotes straight sides and spherical top, with diameter of 14 eighths of an inch.) Made by Hygrade Sylvania [1], it had a 14-volt 300-mA heater. The Philco 46 110-volt DC receiver, ca. 1932, used three 14s, a 17, two 71As, and a ballast resistor in a series-string circuit.

The Philco 17 and Eveready-Raytheon 52.

15 - A five-pin top-cap RF pentode ("detector-oscillator," when used as an autodyne converter), with 2-V 220-mA heater. Made by Hygrade Sylvania, Raytheon (Eveready-Raytheon), and National Union [1, 2], it was similar to a heater-equipped 32. Used as the converter in the Philco 37 and 38 2-volt sets, and as the IF amplifier in the Arvin 517B.

17 - A five-pin general-purpose triode in an S14 bulb, with 14-volt 300-mA heater, made by Hygrade Sylvania [1] and used by Philco.

18 - A six-pin power pentode in an S17 bulb, with 14-volt 300-mA heater, made by Hygrade Sylvania and National Union [1, 2]. Characteristics were similar to those of the 6F6G [3].

20 - A four-pin power triode with 3.3-volt 132-mA filament, made by NU and Raytheon.

29 - A six-pin Wunderlich ("special") detector in an S12 bulb, with 2.5-volt 1-amp heater, made by Hygrade Sylvania [1].

52 - A five-pin "double-grid triode" power amplifier in an S14 bulb, with 6-volt 300-mA DC-only filament. It was made by a number of small sources: Gold Seal, Hygrade Sylvania, Ken-Rad, Raytheon, and Tung-Sol [1, 2, 3]. Rated at 180 volts maximum, it was intended for zero-bias Class A or B amplifiers in sets operated from a storage battery (read: car radios). A pair could give six watts output in Class B with 180 volts. This may have actually been a space-charge triode to get high current with low voltage.

64 - A five-pin top-cap detector-amplifier tetrode in an S12 bulb, made by NU for auto radios, with a 6-volt 400-mA heater [1]. Replaceable by the 36 in parallel-heater receivers [2, 3].

65 - An audio version of the 64 [1, 3] made by NU, with the same heater drain. Replaceable by the 39/44 in parallel-heater receivers [2].

67 - A five-pin triode by NU, with same heater drain as the 64. Replaceable by the 37 in parallel-heater receivers. It may have also been intended as a power tube: rated output was 650 mW [3].

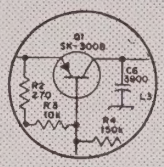
68 - A five-pin power tube by NU in S12 bulb, with 6-volt 400-mA filament. Replaceable by the 38 in parallel-heater receivers [1, 3]. Although termed a "pentode," it had only two grids.

69 - A 6-volt 300-mA version of the 29, by Sylvania.

70 - A six-pin Wunderlich detector in an S12 bulb, with 6-volt 300-mA heater [1]. Had the same base leads as, and only trifling differences from, the 69 [2]. Used in the Sparton 34 auto receiver, ca. 1932.

(Continued on p. 54)

* Named for Norman E. Wunderlich, sales manager at Arcturus, and containing a dual grid which acted simultaneously as the plates of a pair of detector diodes and as a regular grid for audio amplification. Obsoleted early by duo-diode triodes like RCA's 55.



TRANSISTORLAND

EDITED BY
Henry B. Cohen ("Mister Transistor")
2459 Eighth St., Fort Lee, NJ 07024
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Transistor collectors haven't had an easy time obtaining relevant information about these radios. With no single source of intelligence to tap, how does one acquaint oneself with collectible transistor radios? What are fair prices? How old are the sets? What company actually made brand "X"? What colors did specific sets come in? And so on.

With the publication in August of Chronicle Books' Made In Japan, transistor collectors have something of a foundation on which to rally and build. But is the book worth buying? Does it tell us what we need to know about transistor radios?

What you'll see in this issue are reviews of a number of books which could form a transistor collector's essential library - and all of which are flawed. And I'll publish an interesting letter recently received sharing insights on the first generation of subminiature electrolytic capacitors.

The review list includes four books. I considered throwing in Bunis' second job, the venerable "Red Book," but it's short on current transistor information and with their focused The Collectors Guide to Transistor Radios about to issue, why bother? I'll review it next time.

As an author, editor, and 41-year radio technician, I look at these volumes professionally, with no interest in white-washing a review. As a result, I am unsympathetic to any form of gross error, including negligence, bad grammar, poor or inverted photography, or author's whimsy hot spots. The books are good, bad, or in between. That said, let's begin.

Made In Japan

Chronicle Books soft-cover, $16.95, copyright 1993. Authors: Roger Handy, Maureen Erbe, Henry Blackham, and Aileen Farnan Antonier.

On the level of art direction, Made In Japan is a *tour de force* of thoughtful, and frequently beautiful, page layouts. The photography is first-rate, and although color correction is needed to bring some of the shots back to reality (like the cover photo!), overall this is a superb visual experience. The book is, however, flawed in exasperating ways. For example, a Bulova radio shown on page 20 under the banner "All American" was made in Japan. On the next page, two of the four sets shown are hybrids, radios where the output tube was replaced by a pair of transistors. Page 33, lower right, shows a Standard radio. It really is "standard," as it contains a full complement of miniature tubes! On page 74, lower left, resides a REMCO germanium radio, not a transistor job. And so it goes. The error count is incredible for a book that calls itself in the subhead Transistor Radios of the 1950s and 1960s. Worse, no technical information is offered about any radio shown, such as date of manufacture, maker, or model number. This is an unforgivable omission. What comes through are wonderful pictures of radios, many of the sets flawed by cracks and chips, and lively, witty prose which has nothing to do with anything "transistor." Antonier can write, and the words neatly fit the artwork, but does she have anything to say? Especially anything that will enhance your knowledge or understanding of transistor radios? *NO*. She has elected, among other things, to compare these artifacts to automobiles. If there is cross-styling apparent in auto and radio designs, it is probably a function of the art schools of the era and materials available, nothing more.

This is pretentious writing at its worst. I will contrast this work later, when I review Mike Schiffer's book, because he sets the standards of radio-based writing. He knows his subject, she apparently does not. Many major collectors are credited with supplying samples for photography. That's good, but fails to explain why so many pictures show damaged sets. I hope such practice ends with this book. Made In Japan is a treat for the eyes but not the mind. It is a "must have" because of its photography and layouts. It lends credibility to an area of radio collecting that heretofore lacked one. But it is a "coffee-table" book, not a resource for a serious transistor radio collector.

Radios of the Baby Boom Era

Prompt Publications, $16.95/vol., six volumes per set, copyright 1991. No author's credit.

Because many of you are familiar with this anthology, and since there isn't *that* much to say, I'll keep this review brief. The Baby Boomers series, as we tend to call these books, contains many photos of transistor radios of 1954-60. These books were the first to make it possible to identify many these seminal radios. Printed on pulp, the black-and-white photos are of low quality. Technical information is sparse and dating imprecise. Because many sets were sold under different brand names, it's a shame that space was wasted showing them several times over, rather than cross-referencing. These books are nonetheless essential to the serious transistor collector. As more books appear that identify and date such sets, their importance

will wane. For the money you will probably do better by obtaining the first five TSMs. These are Sams' Transistor Service Manuals and may be ordered directly from the company. They also turn up at radio meets.

Evolution of the Radio, Vol. 2, with Prices

L-W Book Sales, $24.95, copyright 1993, edited by Scott Wood.

This is the second in a series of low-budget radio picture books. I mention it because this volume contains a small number of transistor radios, mostly Emerson 888s and Zenith Royal 500s. The formula for the books is simple. Get collectors to send in their best color photos and print them with credits. Start the book with reprints of some old ads and catalog pages and throw in a price guide (?) at the end. Sounds, and is, simple and it works. These are popular books and deliver a lot of bang for the buck. I like this series because it is as unassuming as Made In Japan is pretentious. Mildly recommended if your interests extend far beyond transistor radios or if you love the models mentioned.

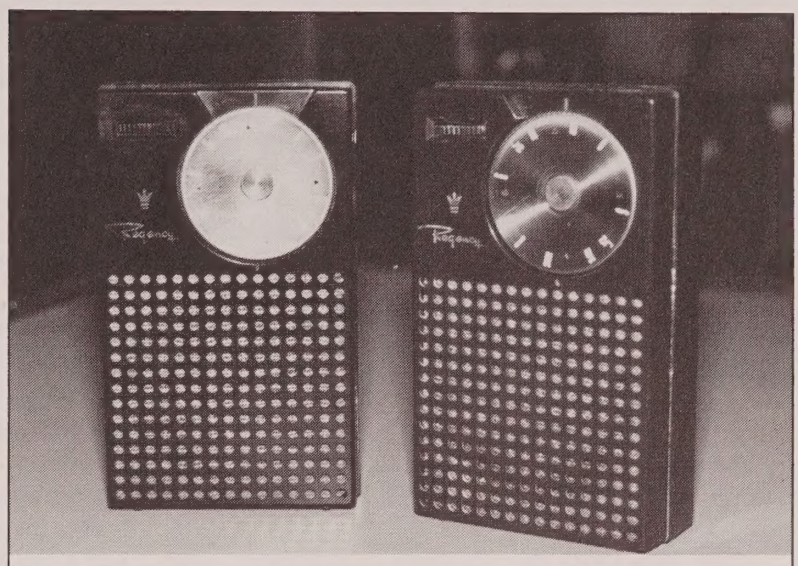
The Portable Radio in American Life

University of Arizona Press, $45.00 (hard cover), $24.95 (soft), copyright 1991. Author: Michael Brian Schiffer.

I've saved the best for last. On first reading this book back in '91, I knew that there was hope. Michael Schiffer knows how to organize, to write, to communicate, and - professor of anthropology that he is - he studied his subject well. A while ago he told me it took two years to write this tome. The long hours show clearly on every page. For the transistor aficionado, he presents two lengthy chapters on the genesis of this technology. He delves into history, talks about "product positioning," and shows how America lost her lead in consumer electronics from the get-go. And there are lots of pictures. It's a shame, but an economic fact of life, that none are in color - the book's only weakness. Still, it's a credit to Schiffer's writing that they don't have to be. If you will buy only one book about transistor radios, and especially if you want to *learn* about them, this volume is a must. It is not a show-and-tell, it is not another pretty picture book, it is simply *the* source. A five-star book in a four-star world.

THOSE IEI CAPACITORS

I mentioned receiving a letter of importance to all serious transistor-radio collectors. It came from Ed Millis, an EE at Texas Instruments during the TR-1 project. In fact, he may have been the chief engineer at that time. It says in part:



Regency TR-1s (black and red), with the IEI capacitors.

You asked me what I knew about the electrolytics in the early Regencys, so I looked in the early radios at my disposal and called a couple of the guys that should know something.

The early Regency TR-1s had "IEI Nashville" electrolytics - four of them. Everybody and the radios agree on that. Nobody could remember what IEI stood for, but "International Electronics or something" seemed to be the faint recollection.* Also, one of my friends said (without my prompting) that he remembered that the IEI was started up by a college professor.

At least one spin-off of IEI was Nashville Electronics, who were making electrolytics and tantalums in 1962. Don't know when they started or finished, but a friend of mine worked for them that year. Probably has nothing to do with the Regency issue.

The capacitors in my TR-1 are brown, with a red end. In the Pat Haggerty S/N 001 TR-1, they are white, with the color on the ends. They are all marked "IEI Nashville," so I guess they made them out of different colors of potting material or whatever.

This letter was in response to questions about the early caps used in TR-1s, as I have seen both styles and thought perhaps one preceded the other. From what Ed says and my experience restoring some 14 sets this past year or so, I'd say you can't tell the age of the chassis by the colors of the caps. So to those who think the first sets had brown/red jobs, and later sets had white caps with red ends, it looks as if "everybody is right."

My thanks to Ed Millis for his prompt and helpful response.

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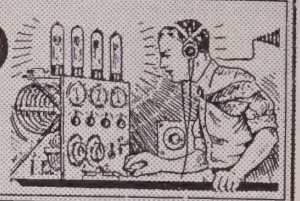
* The June 1957 "Buyer's Guide" issue of *Electronics* does indeed list International Electronic Industries, Inc. in Nashville, as a maker of subminiature electrolytics. - Ed.

AMATEUR RADIO



EDITED BY
Mike Raide, KF2MW
Box 181, Bloomfield, NY 14443
Please include SASE with correspondence.

1929 QSO PARTY

'29 VINTAGE EQUIPMENT

Friday, November 12, 6 PM EST, to Sunday, November 14, 6 PM EST, approx. 3590 kHz

Forty-eight continuous hours of operation will provide greater opportunity for W5s-6s-7s-0s to work the East Coast. Who will make the first transcontinental contact with a transmitter from the Twenties?

The 1929 QSO Party is open to members using transmitters of 1929 or earlier vintage, of the self-excited type: TNT, Hartley, etc. The power input must be less than 10 watts (see below). Participants are encouraged, but not required, to use straight keys and regenerative or other vintage receivers.

There will be a slight change in the rules this year. Members will be allowed to raise power to 20 watts from midnight to 8 AM to encourage cross-country contacts. Although such QSOs are possible with 10 watts under favorable conditions, we can't count on band openings. Hence a little power increase. A reminder: this is a "fun" event and a challenge in the use of primitive equipment. Please, *no modern transmitters*.

Send "CQ AWA." Make as many contacts as possible with other members. Exchange RST, power input, and year vintage for the transmitter. Send a copy of your log, citing equipment used, to Bud Hall, K2LP, Box 974, Eastham, MA 02642. Photos of old-time stations are always welcome for use in the *OTB* report of the event.

READING STATION FREQUENCY TO A KILOHERTZ ON ANY RADIO

Ray Larson
12241-½ Gorham, West Los Angeles, CA 90049-5214

After restoring a GE A-82, I was quite pleased with it, except for setting the dial. The entire 31-meter band was in one quarter of an inch of dial travel. To repeat a setting was very difficult. I then chanced onto a working BC-348. After some alignment, this set was a dream by comparison. Still, the third significant figure of the frequency was guesswork on 31 meters.

Some time went by before I figured a way out of the problem. I had a portable frequency counter. If I could get the station signal strong enough at its received frequency, ahead of the mixer in the receiver, I could read it. A received signal this strong ahead of the mixer is unlikely. One could, however, beat the signal with another signal strong enough to make the counter follow it. So, working with an old Heathkit RF oscillator, it looked promising. Some tinkering showed I would need more output than the generator was arranged for. This was mostly a matter of defeating the large attenuator, to provide about a volt of RF.

This done, the counter read RF to a cycle! However, this is easier said than done. Setting the RF source to better than a kHz is possible but the mechanical aspects of the dial turning tends to limit resolution to a little less detail. I find the addition of a small variable capacitor across the main variable cap of the generator can get to a kHz without much trouble. This seems all that's needed, as commercial stations will have frequencies which end with whole numbers, not fractions, of kilohertz. I now can read out station frequencies almost as well as on the expensive new-generation receivers.

Whether the generator will require modification depends on the designed output power of the generator and the sensitivity of the counter, both of which vary widely. A G-R 1192B counter, for example, needs as little as 3 mV to trigger reliably. An AN/URM-25F generator offers far more than this level, from either the attenuator output or the special high-level output. By contrast, the Heathkit RF-1 generator and others like it will not produce this much without modification.

Regardless of the method, this technique greatly enhances one's ability to identify DX broadcast stations, or to preset the receiver to the frequency before the station even signs on. It's as effective as the old BC-211 heterodyne frequency meter - without the messy interpolation charts! - Ed.

MEET THE COLLECTORS

Rodney Schrock, KD3OR
402 Lincoln St., Somerset, PA 15501

FIXING A MOUSE NEST - PHILCO MODEL 53-562

One day, a local scrap dealer gave me a filthy plastic radio - a Philco 53-562.

I noticed it was a Transitone model and was surprised that the name had survived as late as 1953. Since then, I've found two more - one in a later Photofact and one in *A. R. C.* I don't know if they were built later.

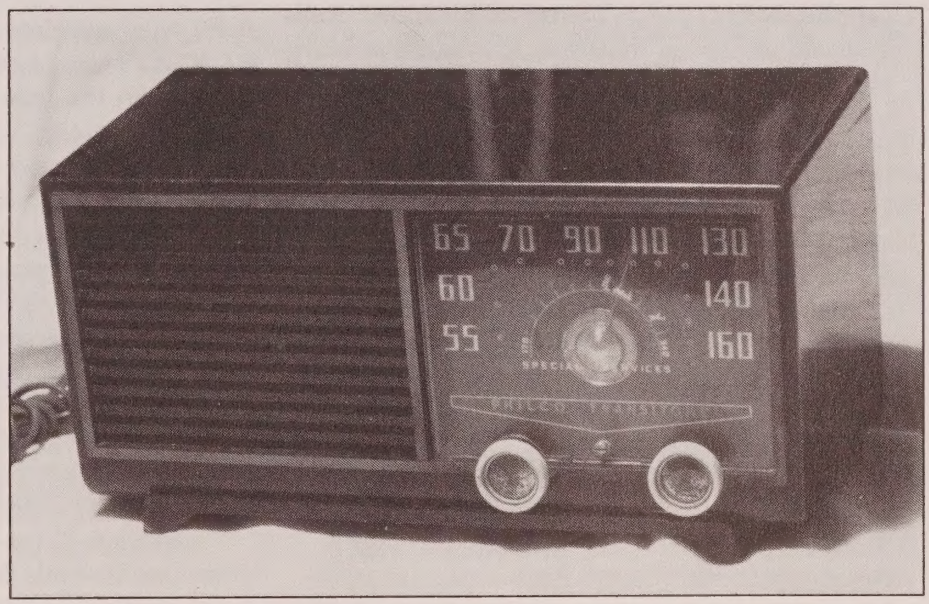
The radio was in sad shape, having served as a residence for mice. It was solidly packed with fluff, newspaper, etc. The fill was soft to the touch; these critters know what they are doing.

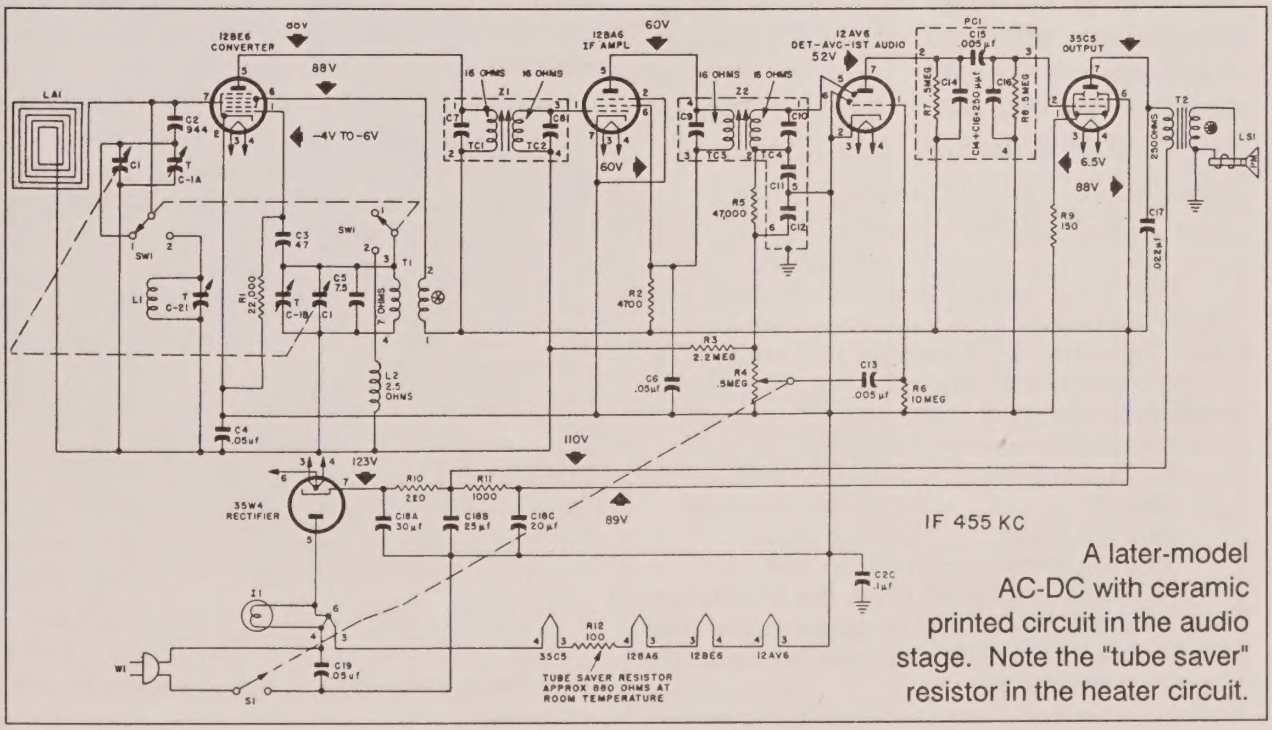
First, I gave the radio a thorough cleaning - removing all the dirt, grit and grime; also correcting the obvious mechanical defects, stringing dial cord, etc. The loop antenna had been chewed; I removed the defective turns, then cemented turns of enameled wire in their place.

I tested and replaced the filter capacitors, checked the B+ distribution bus and decoupling, replacing a bypass condenser, and applied power. No sound - swapped out a gassy 35C5. The radio passed an IF signal, but the 12BA6 was noisy.

The set still did not play - the local oscillator was inoperative. By accident I found the grid condenser strangely intermittent. Replacing it brought the radio to life. It played well on AM.

The "special services" band (1.7-3.4 MHz) was sloppy - perhaps the oscillator coil had deteriorated. I don't know why it was added in the first place, covering only 160 meters, the old aviation band, and the one-time ship-to-shore spectrum, but only bordering on 80 meters.





A later-model AC-DC with ceramic printed circuit in the audio stage. Note the "tube saver" resistor in the heater circuit.

EQUIPMENT RESTORATION

EDITED BY
LUDWELL SIBLEY, KB2EVN
44 E. Main St., Flemington, NJ 08822
Correspondence requires SASE for reply.

A GUIDE TO ZENITH TRANS-OCEANIC SERVICE DATA

A. G. Tannenbaum
P. O. Box 110, East Rockaway, NY 11518

Owners of the popular Zenith Trans-Oceanic often need repair and alignment information on these sets, either the tube or the transistor versions. The *pre-war* Trans-Oceanic is covered in the Zenith 1942 service data book, form H-11. The model is 7G605 and the chassis is 7B04.

Information on postwar Trans-Oceanics is available mainly from the Sams' Photofacts and Transistor Service Manuals (TSMs) listed below. Sams originally published transistor schematics as individual Photofact folders. Later they grouped them into TSMs. Service data on many of the earliest transistor radios are available as either a folder or part of a TSM.

		Sams Reference		
Model	Chassis	Set	Folder	TSM
8G005Y	8C40	7	33	
8G005YT	8C40T(Z2)	53	27	
G500	5G40	83	16	
H500	5H40	152	12	
L/R/T600(L)	6R40, 41	254	13	
	6T40, 41	254	13	
A600	6A40, 41	381	16	
Royal 1000		420	14	TSM 3
Royal 1000D		451	20	TSM 6
Royal 1000D	9HT40Z2	582	14	
Royal 1000-1	9HT40Z8			TSM 73
Royal 3000	12KT40Z3			TSM 33
Royal 3000-1	12KT40Z8			TSM 74
Royal 7000-1	18ZT40Z			TSM 157

MADE OUTSIDE THE U. S. - NOT IN SAMS

Royal 7000-1	2WKR70 (Zenith RA 105)
Royal 7000-2	2WMR70 (Zenith RA 111)

While Sams' material is the most consistent in format and easiest to find, other information on the tube Trans-Oceanics is available. The 8G005Y (ch. 8C40) model is in the Supreme Most-Often-Needed 1946 Radio Diagrams, p. 188.

Rider's binders cover the following:

8G005 (Ch. 8C40)	Vol. 15, pp. 15-63, -69
8G005BT	Vol. 15, pp. 15-64, -69
G500 (Ch. 5G40)	Vol. 20, p. 20-12
H500 (Ch. 5H40)	Vol. 22, p. 22-4

The military R-520/URR (*OTB*, Vol. 28 No. 4, p. 44) is like Ch. 5G40 except for power supply. Fair Radio Sales, (419) 223-2196, sells copies of the tech manual for $7.50.

PLUGGING BIG HOLES IN EQUIPMENT

Bob Haworth, W2PUA
112 Tilford Rd., Somerdale, NJ 08083

How many times has it happened? You just purchased that ol' communication or antique radio, deciding to restore it to original condition, only to find that someone has drilled holes in the chassis or panel. The urge to update equipment is ever-present and the hole sure isn't original. Well, these hints will help disguise the hole, but of course fall short of welding, grinding and painting.

A trick I have used on holes (in chasses or cabinets) where repainting is necessary anyway is this:

1. Cut a piece of .002" or .003" shim stock slightly larger than the hole (on a 3/8" hole I make the piece 1/2" square).
2. Apply epoxy to one side and place on the inside of chassis or cabinet. Cover a piece of wood with waxed paper amd clamp the piece in place with the covered wood. A C-clamp or wood clamp (with parallel jaws) works great.
3. Let cure, remove clamp, and fill the outside with epoxy. When hard, sand smooth and repaint.

Where repainting cannot be done, I find the following makes a professional job.

1. Cut a piece of air-duct (galvanized) metal, about .020" thick, to a larger size than the hole.
2. Take a 6-32 (or 4-40) *flat-head brass* machine screw and tin both the head of screw and the center of the air-duct piece. I use a small hand torch.
3. Solder the screw head upright (in long-nose pliers) to the duct piece. Let cool.
4. Retrim the piece to roughly round, larger than the hole and roughly centered on the screw.
5. Chuck the screw into a 3/8" or 1/4" electric drill. Tighten snugly but don't crush the threads.
6. Put on your safety goggles and be careful in the next step. The peripheral speeds make the hole-plug a lethal weapon if your solder joint lets go. (So far I haven't had that happen.)
7. Turn on drill and place the duct piece (at a right angle) against the surface of a disc sander. In short order you will have a beautiful round hole plug, with a thinness that is easily overlooked.
8. Sometimes it's necessary to file off excess solder, but the plug can now be painted or plated or ?, and can easily be attached with a backup washer or more duct material and a nut and lockwasher.

Happy hole-plugging. Someday I'm sure we'll all meet the people who put holes in those beautiful antiques . . .

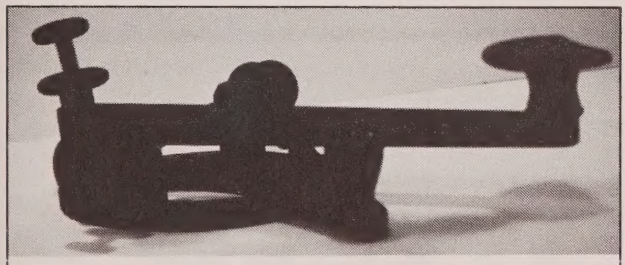
KEY and TELEGRAPH

EDITED BY
Roger W. Reinke
5301 Neville Ct., Alexandria, VA 22310-1113
Please include SASE with correspondence.

PATINA vs. POLISH (Part I)

If a few dedicated telegraph collectors happen to get around some hot coffee during a cold, rainy flea market, chances are a debate will ensue before long. It might be about the value of say, a midget Vibroplex, but chances are the topic will be a favorite technique for removing 50 or 100 years of dirt, grime, grease, and oxidation; or fixing plain old wear-and-tear. It might well concern the wisdom of undertaking any restorative measure at all. What should be done with antique instruments is subjective, but before taking drastic action or none at all, think about what best protects your investment and the ethical ramifications of something you might be tempted to do.

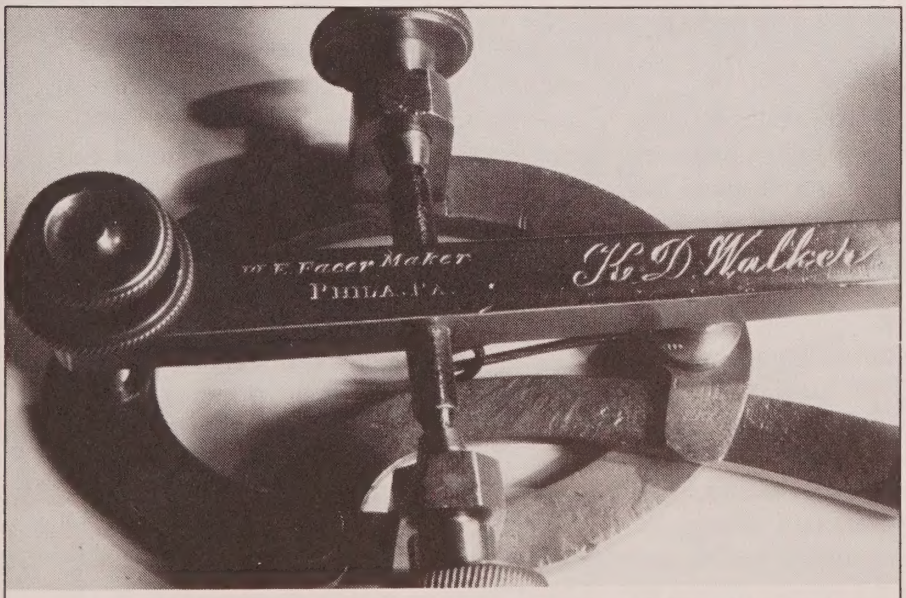
"Hold on," you say. All you want to do is clean up a filthy old key, right? Before soaking your treasure in lye, ask yourself if the action you take will restore the piece to its original operating condition. Will it do what it was supposed to do? (Have you ever seen what lye does to aluminum sounder levers? It eats them. Whole.) Regardless of appearance, clean or dirty, its ability to function as intended should be foremost. A non-operative key or "bug" may look great in your display, but it's like an empty beer can -- for some, it may have appeal as a "collectible," but for most, the purpose it served has been lost. Reconnecting a wire broken off at a coil base is a mildly frustrating and undoubtedly time-consuming task . . . but the satisfaction of making a junkbox fugitive a working piece is unattainable any other way.



As found: maker's name, etc. illegible.

Most telegraph instruments are made largely of brass, but iron magnet cores and armatures are necessary parts of sounders and relays, and almost always show some rust. Brass is soft, so it's bent or deformed easily; it tarnishes, and if instrument lacquer was applied, the coating is probably an ugly brown. If the copper content is high, it might over time even develop a greenish patina or efflorescence. "Practice" or "learner's" sets present a slightly different problem in that key and sounder bases are usually japanned black cast iron, with some decorative gold striping or flourishes, little of which survives damp basements.

There's no question that most collectors prefer to find telegraph equipment in its last operational state -- "as removed from service." It may look awful, but if resale or trade is your goal, leave it alone, even if wires are loose or moving parts are frozen. A pair of pliers in the hands of a well-meaning "fixer" applied to stuck brass adjusting screws is a scenario for disaster. If it is missing a part or two, don't try to make it whole by substituting something that "comes close." Much of the appeal of collecting derives from appreciation for careful, attractive machining and hand finishing, skills that are probably beyond most of those who would try to



After restoration. Inscription: "W. F. Facer Maker Phila. Pa." Facer was in business in the late 1860s at 48 S. 4th St. The key was owned by K. D. Walker, who had his name engraved on the lever, as was customary with operators working various jobs.

replicate them. Yielding to the temptation to shine up a piece to enhance its potential for sale might be rewarded, but chances are most knowledgeable buyers will regard the piece with some suspicion, if not rejection.

Decisions as to the degree of restoration become tougher when you've finessed a rare piece that will stay in your collection. I try to find a middle ground, if possible, between absolute hands-off and wholesale dismantling/cleaning/polishing/refinishing/reassembling. There is no way to reproduce the patina that brass takes on over a span of years, even if instrument lacquer has been applied. To many, the debate ends right there. Some embedded discoloration, perhaps a little rust, is tolerable for the sake of undisturbed evidence of age.

Well, there's patina and then there's grunge. The top photo shows a key of handsome proportions, obviously early, but so tarnished that it looked almost as though it had been painted black. Some markings were apparent, but illegible. Although the key was functional, a decision had to be made to either wonder forever what was under the "patina," or take a chance in the hope of learning who was responsible for a beautiful job of design and manufacture. Curiosity won in this case. A careful soaking in instrument lacquer remover followed by a rubbing down with #0000 steel wool and "Brasso" brought to light some interesting details, as shown in the bottom photo. The key may look "too new" for some tastes right now, but it is gradually acquiring some patina.

There may be as many favorite recipes for removing accumulated grime from telegraph instruments as there are opinions about how much restoration is desirable. Part II will offer some suggestions that work reasonably well; if you have a favorite technique and/or sources for restoration materials, please drop us a line and we'll try to share as much as we can.

In the mean time, *never*, *never*, apply a wire brush, motor-driven or hand-held, to a brass instrument. There is nothing as discouraging as a decent instrument "shined up" by some misguided soul who has gouged, maimed, and permanently deformed the piece. In fact, the use of any grade of steel wool above #0 on brass will likely result in scratches that detract from final appearance. In the late 1800s, nickel plating of instruments was popular, and it's tempting to buff such instruments up a bit -- but exercise restraint, because there's usually brass underneath, and the nickel plating is quite thin. In summary, better to spend a few more minutes in gentle persuasion than assault with nuclear weapons. Replate the nickel? More on this in Part II.

(Continued from p. 4)

then good on the other days. The "hottest" item for sale was a Signal Corps mule-pack tube receiver, Serial No. 1, in fine shape. Another vendor offered a complete RS-6 clandestine radio station.

SIGHTSEEING EXCURSION

The annual tour enjoyed fine Finger Lakes autumn weather on Friday, covering the Seward Mansion (Auburn), the Coverlet Museum (Palmyra), and lunch in Skaneateles.

BOOK FAIR

The Book Fair was expanded (again), now to eight vendors and 2½ days. Exhibitors reported good reaction to their wares, which included just about everything that's in print (or out of print!) on antique radio. The new AWA Review 8 was introduced at the Conference to a brisk reception.

MUSEUM

The Museum held its special hours again. The Thursday bus tour was delayed from morning to afternoon, but gained an additional 10 riders.

AUCTIONS

This was an unusually busy year in the auctions. AWA was selling, for the beneficiary, a large estate of communications gear, tubes, books, and broadcast sets. This occupied a special session on Thursday just after Ed Gable's normal Communications Equipment auction, and swelled the regular Friday auctions to a record 600 lots. Fortunately, a 16-page catalog was available describing the material, making the auctioning process quite a bit easier. The catalog contained, as a sort of price guide, bid results for the last four years of the comm-gear auction.

On the following pages reporting auction prices, estate lots listed in the catalog are pointed out for ease in looking up the contents.

The auction highlight on Thursday was the Hallicrafters DD-1, ca. 1940, which drew $925. We saw record bids for National SW-3s: a particularly fine one went for $400, another for $390. Friday's auctions featured an off-blue Fada Bullet Catalin at $2400, a Marconi (H. J. Round) ERECT diode at $550, and a lovely Ericsson brass-and-glass Morse register at $2300. Book offerings were only so-so this year, but the Friday auction included 12 top receivers and speakers from a second estate, drawing strong bidding interest. Western Electric tubes were a major focus, with "good" tennis-ball types and VT-1s in big quantity but selling at about twice last year's prices.

PHOTO COVERAGE

It's a bit skimpy this time - the huge auction lists crowded pictures out of the available space. We'll have a lot more in the February *OTB*.

NEXT YEAR

The Conference will be Sept. 21-24, with dual themes: (1) the 150th anniversary of the telegraph, and (2) WW II military communications.

THE LOUDSPEAKER

EDITED BY
FLOYD PAUL, W6THU
1545 Raymond, Glendale, California 91201
All correspondence requires SASE for reply

TOWER MFG. CORP.

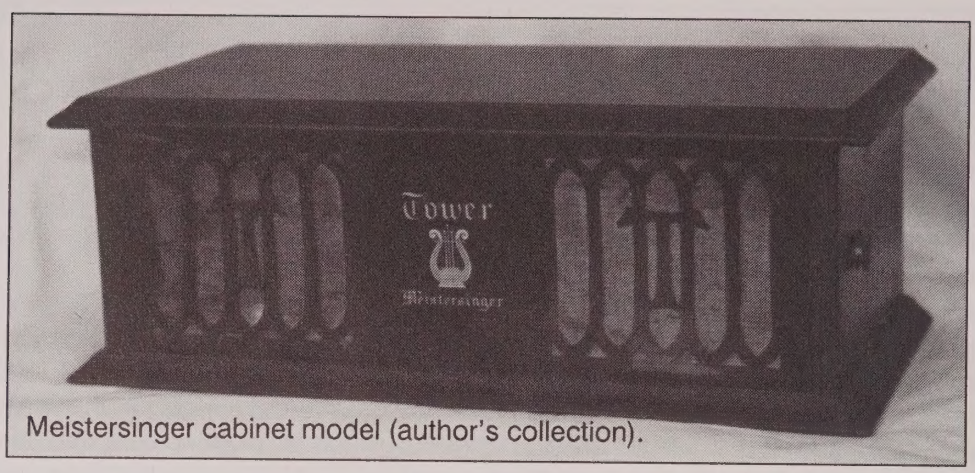
The Tower Manufacturing Corporation, of 98 Brookline Ave. in Boston, was an established maker of radio headsets. It started advertising a horn-speaker product simultaneously via three magazines in April of 1925: *Radio Broadcast*, *Popular Radio*, and *Radio News*. The horn advertised was the Tower "Scientific" loudspeaker priced at $8.50. The advertising photo showed a straight-neck fiber horn, with a 10" diameter bell, about 21" high. The ad noted the horn was finished in golden bronze. The ads showed a decal of approximately one inch diameter located in the lower lip of the bell. It pictured a winding pathway leading to the base of a castle.

Lightning zips past the tower.

June issues of the magazines added a smaller "Spitfire" fiber neck and bell horn model at $4.95, and a Meistersinger duraluminum gooseneck and cast-iron base speaker at $15. (Collectors of Tower headsets will recognize the names "Scientific" and "Spitfire." - Ed.) This more expensive horn had a spun-aluminum bell and a cast aluminum neck. An August, 1925 full-page advertisement in *Radio News* noted that all loudspeakers were equipped with adjustable [driver] units. Another full-page ad in October showed a sketch of the $8.50 "Scientific" horn to be a slightly curved gooseneck horn, whereas the earlier ads showed the neck as straight. In November, 1925 a cabinet speaker was introduced, advertised as having mahogany sides and top panel. The front panel was

Decal on the top-of-the-line Meistersinger horn.

"A merry Christmas for all," from *The Radio Dealer* of December 1925.



Meistersinger cabinet model (author's collection).

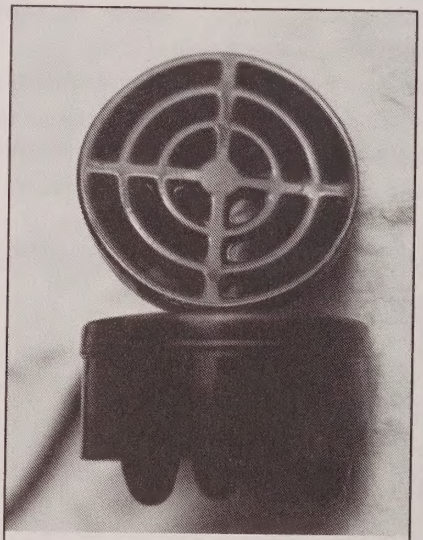
celluloid material which is "tortoise shell" in appearance and was probably DuPont Pyralin. (These units are scarce today!) In December the first advertisement showing a midget horn appeared. It was priced at $3.95 and was most likely Pyralin also.

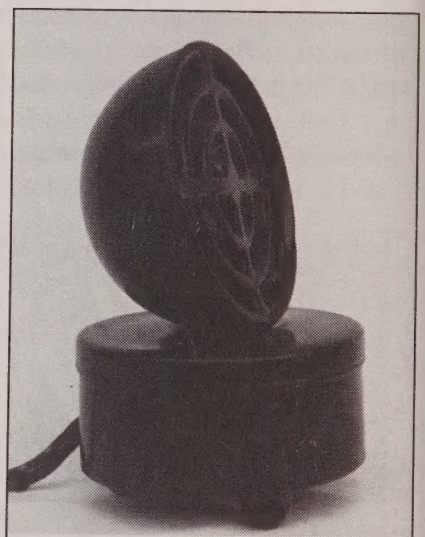
A new earphone diaphragm was shown in January, 1926 ads. The diaphragm had varying thicknesses and two different materials. The diaphragm was further discussed in the next month's issue, in terms of "Exhaustive experiments, by the eminent Russian scientist, Dr. Herman Fisher, who is an acoustical expert with the Tower Co. and has perfected a marvelous new diaphragm." The ad's sketch showed four spokes converging inward from a circular ring and supporting a smaller disc in the center.

The last ad for this rather extensive line of horn speakers was in April 1926 in *Radio News*. The May issue had a full-page ad by Tower showing a *cone* speaker at $9.50. The era of Tower horn speakers had ended.

The cabinet model is shown in this issue. The tortoise-shell midget horn, which is 4-3/4" high, was included in "Midget Horn Speakers" in the *OTB* (Vol. 30 No. 1, May 1989, p. 28).

"Scientific" duraluminum horn.


Translucent "Midget" horn.


"Midget" horn, side view.

With the Radio Age in full swing, get new use from that disused Victrola. *Radio News*, Sept. 1925.

RAILROAD DISPATCHER'S CALL

Alton A. DuBois
67 Peggy Ann Rd., Queensbury, NY 12804

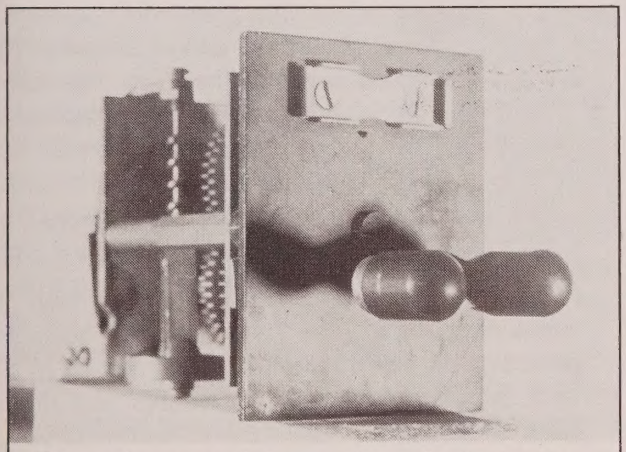
This device is not radio or telegraph equipment as such, but part of a selective signalling system. It was used on a single-line telephone system to signal specific stations. Most railroads employed it as a dispatcher-to-station ringer.

It works as follows: the dispatcher has on his console a group of coded signal transmitters as shown in the photos. When he wants to call a station, he turns the two-handled knob on the transmitter for that station. This sets into motion a spring-driven gearage and governor that turns a notched cam. The cam operates a relay that alternately applies a specific number of pulses of 200 to 300 volts negative and positive to the line.

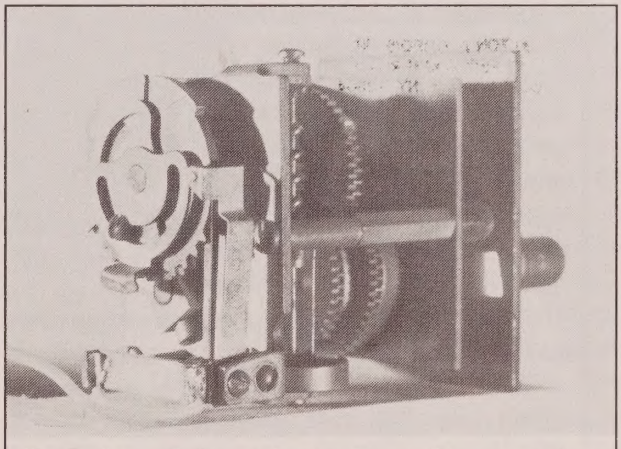
At each station, a selector unit follows the signal sent out but is coded to respond only to its individual pulse sequence. The receiver in its glass cover is shown in the photos. It contains a code wheel and latching system. The wheel has pins in prescribed holes in the wheel.

As the sender latches all the receivers on the line, only when a pin is caught by a finger is the wheel held in place. All of the others that do not have a pin in place will fall back to zero. Each time a double pulse appears, it turns the wheel until the coded sequence reaches the end of its rotation, closing a contact that rings the station bell.

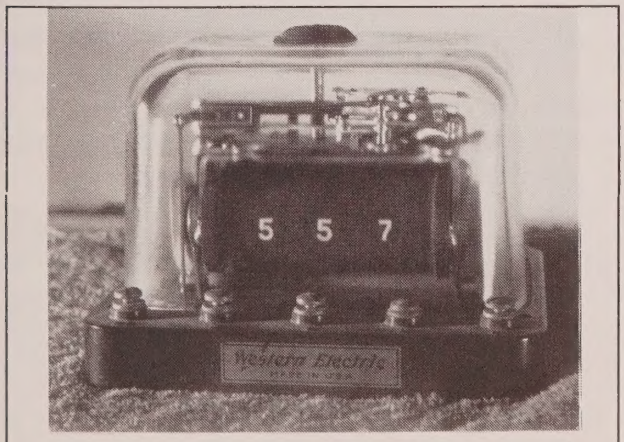
The system remained in use up until very late when the railroads went to audio and tone signals. Now they use radio. These machines are now hard to find and not many people recognize what they were used for, except maybe electricians or telephone men. My experience with them was in the military during World War II. My unit, the 711th Railway Operating Company, built a complete railroad in Louisiana after Pearl Harbor. We con-



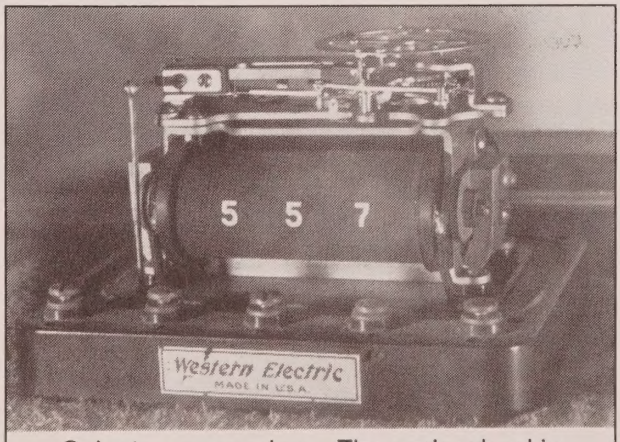
Dispatcher's code transmitter, dedicated to a specific station to be rung. The station name goes in the card holder at the top.



Rear view of dispatcher's transmitter, showing gear train, speed governor, toothed cam with the code, and sending contacts.



W. E. 60AP selector. Intended for railroad way stations exposed to dust and coal smoke, it is protected by a heavy gasketed glass cover. "5-5-7" is the code for which this unit is preset, with total pulses fixed at 17.



Selector, opened up. The code wheel is above the latching levers and ratchet drive wheel. Six pulses (+/-) will latch the wheel if the pins are in sequence. The two coils have a bias magnet to make them polar.

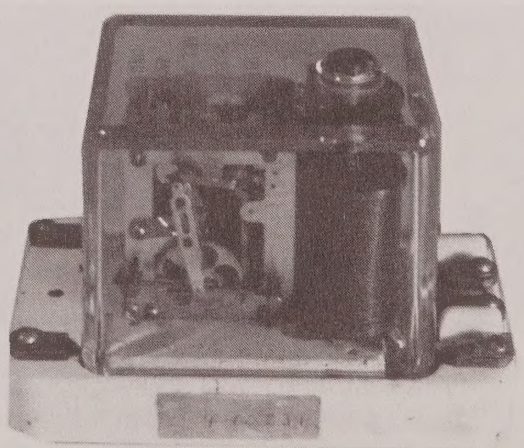
nected, through Camp Claiborne and Camp Polk, the Missouri Pacific and Kansas City Central Railroads. The line became a training road for future railroad battalions. We left and went to Iran in 1942 to operate the Trans Iranian Railroad to supply Russia. The railroad there was a single-line magneto system.

Western Electric, ca. 1910-25, was the main supplier of telephone dispatching systems to the railroads. They offered selective signaling, plus special telephone sets, and one-tube amplifiers and horn speakers for the dispatcher's position. The signaling system was used widely in North America - and even in England, in an elaborate 1923 installation for the London County Council Tramways.

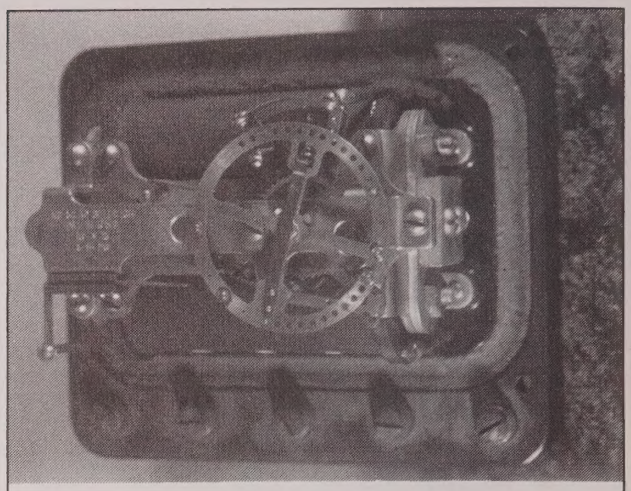
The 60-type selectors took total code counts of 13 (60BA), 17 (60A, 60AP, 60BC), or 23 (60BR). After the railroad application, they were used in dial selective signaling systems for long-haul telephone private lines and "order wires," for remote on-off control of equipment at distant carrier repeater stations, and for selectively calling ships at sea in ship-to-shore telephone service. When mobile telephones first appeared in 1946-48, the mobiles included 60-type selectors so that the operator could ring them selectively. In these applications, +/- pulse signaling was not possible, so alternating bursts of 600- and 1500-Hz tone were used instead.

Today the railroad dispatcher's transmitters are much harder to find than the selectors.

In the *telegraph* world, there was sometimes a need to alert operators selectively at distant points on a multipoint line. The Gill selector, like the W. E. unit but differing in mechanical design, was used for this purpose. It responded to code pulses sent as combinations of Morse dashes. It was made by the Hall (later Union) Switch and Signal Company, a railroad supplier.



Gill selector, set for code dashes of 1-2-3-3-1.



Top view of the code and ratchet wheels.

THE TUBES RCA DIDN'T TELL YOU ABOUT

(Continued from p. 43)

72, 73 - For the record, these were high-voltage rectifiers of the early '40s, comparable to the 3B24, used in radars.

88 - A full-wave rectifier, maker unknown, like the 83V but rated at 125, rather than 100, mA [2, 3]. Unrelated to the Rogers 88M or 88S pentodes covered by Tyne, or to the Westinghouse-RCA prototype UX-288 gas diode.

90 - A Wunderlich detector from Ken-Rad, S12 bulb, 2.5-volt heater [1]; same pinout as 69 and 70.

91 - A mercury-vapor triode thyratron with 110-volt heater, in a large four-pin ST-23 bulb with plate cap. It was intended for use in pairs in 250-watt inverters to power AC radios and phonos from a 110-volt DC line. Developed by GE-RCA but "not listed for distributor sales" [4], the 91 was probably never made in commercial quantity.

92 - Ken-Rad's 6-volt version of the 90 [1].

95 - A power pentode comparable to, and replaceable by, the 2A5 [2]. Maker unknown (probably Ken-Rad).

96 - A four-pin half-wave mercury rectifier in an S12 bulb, made by Ken-Rad and with a 10-volt 500-mA heater [1]. Replaceable by 1-V.

98 - A five-pin full-wave rectifier made by Ken-Rad, dual- (or triple-) numbered as the 84/6Z4.

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1. RCA, "Receiving Tubes Not Manufactured or Merchandized by RCA Radiotron Division - Competitors' Receiving Tubes," July 20, 1935.

2. "Receiving Tube Characteristics and Interchangeable Tube Types Chart," in A. A. Ghirardi, Radio Troubleshooter's Handbook, 2nd ed., 1941.

3. "Tube Data," in W. F. Boyce and J. J. Roche, Radio Data Book, 1948.

4. RCA, "Special Purpose Tubes," Jan. 20, 1938. Described in W. R. G. Baker and J. I. Cornell, "D. C. Inverter for Radio Receivers," *Electronics*, Oct. 1931, pp. 152-154.

RADIOFEST REVIEW

Jerry Vanicek
PO Box 4743, Chicago, IL 60680

Would you like to add a choice radio or two to your collection? Do you wish to make contact with some of the most active collectors and dealers on earth, or learn about radio history while having an enjoyable vacation with the entire family? If your answers are yes, you should consider attending next year's Radiofest.

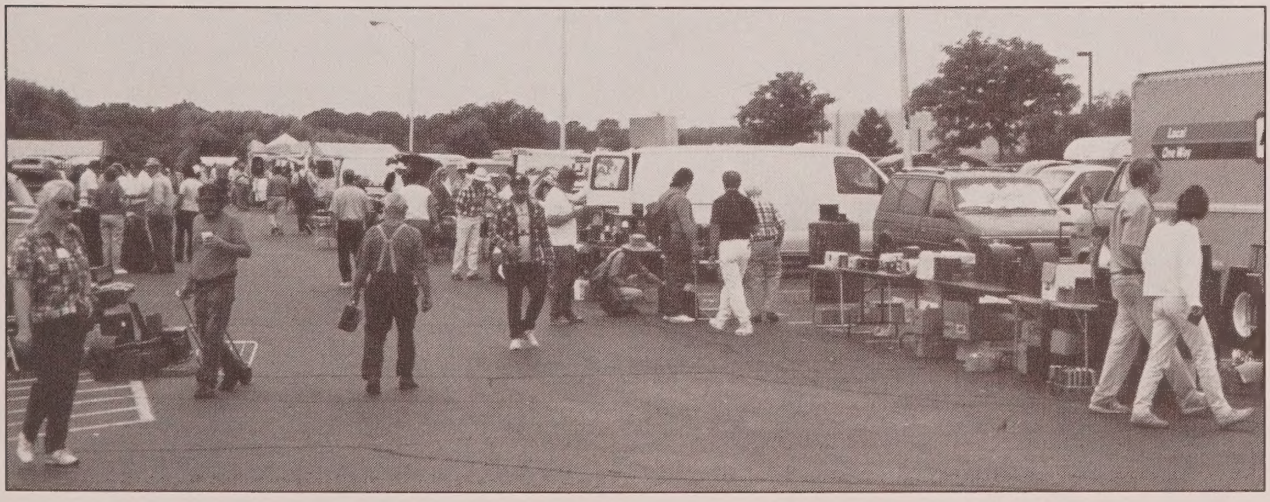
August 4-7 marked the 11th year for Radiofest. Started in 1983 by the Antique Radio Club of Illinois, the meet has grown to be one of the largest in the world. This year's event was again held at the Holiday Inn at Elgin, IL; less than 20 minutes from O'Hare International Airport. The location provides a small-town setting, while being only a 40-minute drive to downtown Chicago; in the city's most popular vacation season.

Ralph Muchow with Atwater Kent clock-radio-fountain in the Muchow collection. *Photo: R. Bury*

This year's Radiofest had a registered attendance of over 550 collectors plus their families; from as far away as South Africa, Europe and Japan. ARCI runs Radiofest to break even financially. In order to lessen the visiting collector's monetary burden, families are charged a flat rate. Family members were therefore not counted in the attendance figures. ARCI's philosophy is evident throughout the meet; ranging from the famous "Joe Willis Hospitality Suite," a gathering place where a tired collector may obtain free refreshments, to the congenial help and service provided by the club volunteers and the Holiday Inn staff.

A major aspect of any meet is the flea market. This is where Radiofest excels. The flea market filled the parking lot and spilled over into a large adjacent field. The paved lot contained 297 cars and trucks occupying 404 spaces. An additional 110 vehicles, using an indeterminate number of spaces, filled the grassy field. An early-morning tour of this vast arena revealed hundreds of cars and trucks with license plates from over 38 states.

What type of gear can be found at Radiofest? Almost anything from early wireless to rare transistor radios. A survey of six knowledgeable collectors revealed the following sales: two Paragon RA-10s, a DA-2, two Paragon A2 amplifiers, two blue Neutrowound radios, an SE-1071 Navy detector box, Federal 9 and 110, Kennedy 220 and 281, Magnavox one-step amplifier, Radiola 7B, Coca-Cola cooler radio, a two-piece Canadian Marconi M1 receiver, De Forest BC-86B and BC-98B transmitter and receiver, BC-131 and IP-501A receivers, Firth 35B, two Crosley Harko Seniors, two Zenith 1Rs and a 2M, two spherical audions, a number of breadboards including two Model 12s, Sodion DR6 with amps, a white Regency TR-1 with original box, several early microphones including a nickeled RCA Model 44, a prewar Westinghouse TV, Scott radios including a Napier and a Shield Grid Nine, RCA D22, a sealed deck of AK playing cards, RCA book radio from Chile, and a number of Catalin radios such as a blue Em-



Zenith transistor display. *Photos: Bill Ross*

First-prize display, radio-premium category.

erson tombstone and a Motorola green-and-gold model with speaker grill. There were countless other sales; a constant stream of collectors carrying items back to their cars like the proverbial ants at a picnic. A commercial packing service was available on-site for collectors who wished to have their purchases mailed home.

If there was nothing to your liking at the flea market or if you had some unsold merchandise, you could still try your luck at the Thursday night auction. The auction premium was 10% with a $100 per-item maximum. Sales totaled over $32,000. Equipment ranged from a WW I German amplifier and French crystal sets to consoles and transistor radios. There was also a smaller donation auction on Saturday.

Radiofest can be an educational experience. Ralph Muchow again opened his famous museum. Thousands of radios were on display; along with a seemingly endless amount of associated material. The exhibit is possibly the largest anywhere. A novice collector would marvel at the collection's vast quantity and range, while advanced collectors can study some of the many unique items from various stages of radio history.

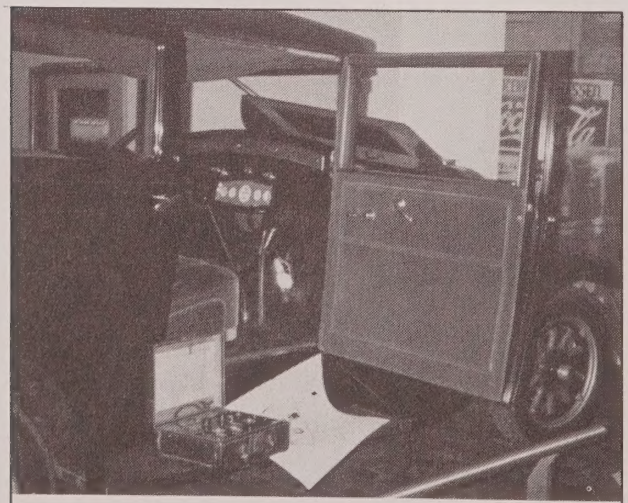
The Motorola company also opened its museum at Schaumburg and provided special tours to the visiting collectors. ARCI furnished buses, at cost, for these outings.

A 13-category equipment contest provided an opportunity for participants to compete in almost every field of the hobby.

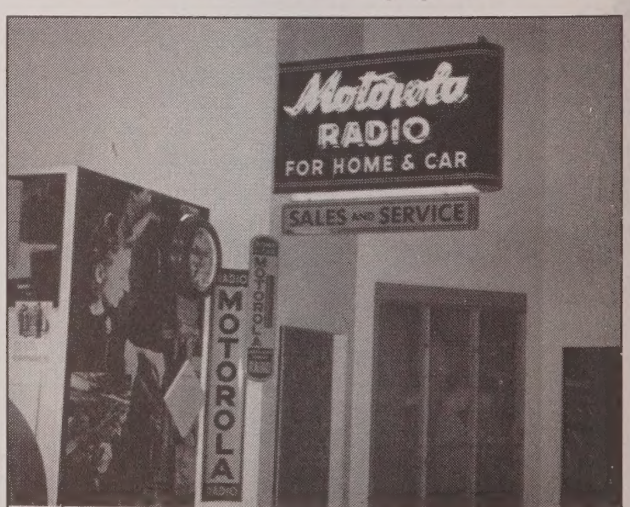
As in the past, club members erected a special exhibit at the Inn. Previous years' exhibits ranged from Zenith radio to television to a selection of rare tubes from the G. F. J. Tyne collection. This year's theme was transistor radios. Collectors could learn about this newest and possibly hottest aspect of our hobby. The exhibit room appeared to be completely filled with a vast quantity of these colorful sets.

Among several talks, Matthew May presented a hands-on demonstration of the repair of antique radios. Joe Schroeder gave an informative talk on communications receivers. This year's guest banquet speaker was John Ghrist, who covered the history of broadcasting in northern Illinois.

Attendance at a radio meet, be it a small local gathering or a major event, can prove invaluable to the understanding and enjoyment of our hobby. Each conference provides its own unique experience. While there is no one "only" meet, Radiofest does convey the friendliness and hospitality of a local club while hosting one of the largest flea markets anywhere. Shouldn't next year's Radiofest be a part of your collecting agenda?



Auto-radio repair display, Motorola museum.



Theme signage in the Motorola museum.

A THREE-WATTER FOR THE LINC CUNDALL MEMORIAL OT CONTEST

Parker Heinemann, W1YG
87 Cove Road, Lyme, CT 06371

INTRODUCTION

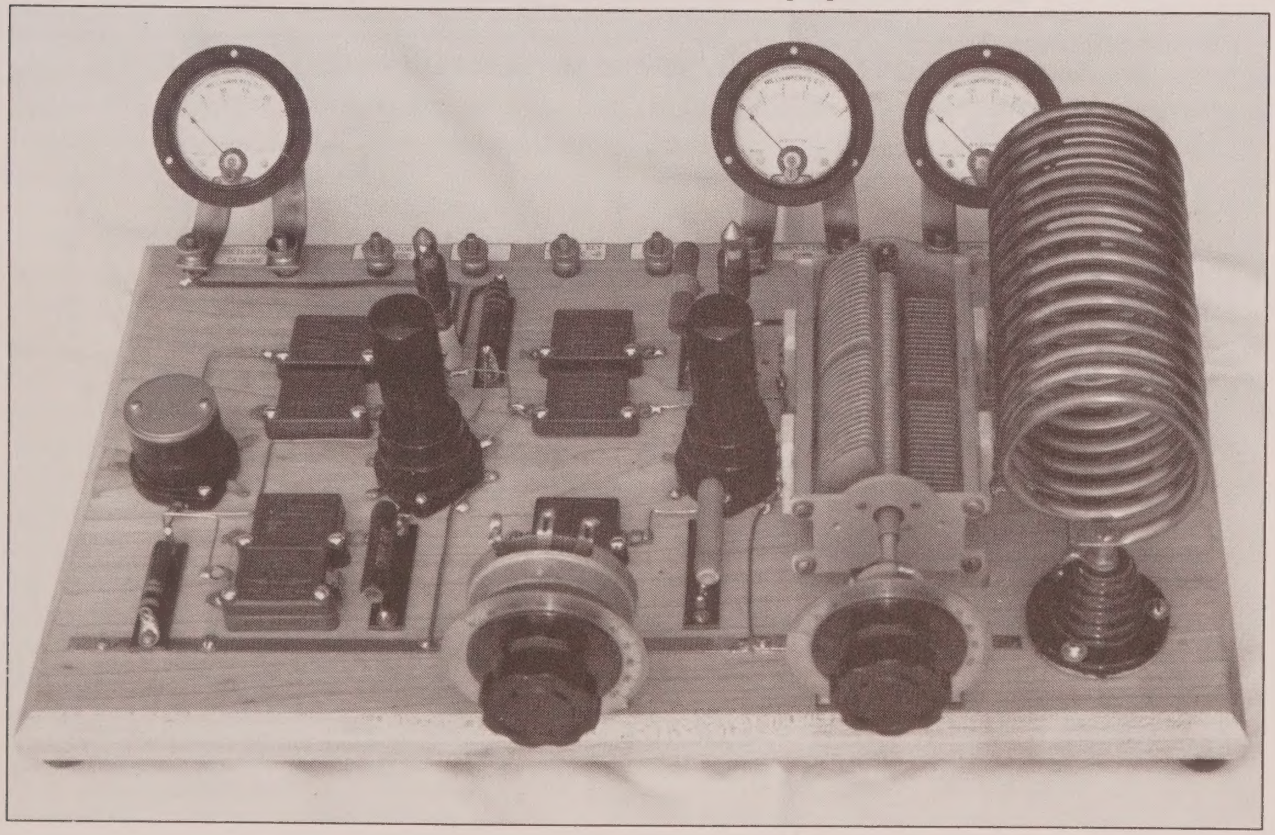
When the OT contest rules were modified by incorporating the new 2.99-watt QRP category, I was caught by surprise! I wanted to try this category but had no effective way to reduce the power of my existing contest transmitter (Collins 32A), much less accurately measure the plate input. Also, the efficiency of the 1934 Collins transmitter was probably less than could be achieved with 1941 technology. After all, with less than 3 watts of plate input, any ardent OT contestant should strive for every additional percent of plate efficiency possible! So, with only a few days of construction time available before the contest, I decided to build an OT transmitter to fit the new category.

A search of available 1939-41 literature revealed no construction project which suited my objectives, except for a few articles on low-power portable and emergency rigs. Then I realized - QRP was not in vogue in the late 30s and early 40s. If I wanted a 1941-technology, 160- through 20-meter 3-watt transmitter with provisions to adjust and measure plate input power accurately, it would have to be an "original" design. With time running short, I consulted with two transmitter experts: Bob, W2LYH and Oz, W6AD. The resulting design took two days to construct and another day to test and de-bug. It worked so well that I wanted to share the details with all AWA members in hope that it would encourage some new contestants in the AWA Linc Cundall Memorial OT Contest.

OSCILLATOR CIRCUIT

I favor using crystal-controlled oscillators for the OT contest for two reasons: first, because they represent the mode of frequency control used by the majority of amateurs during the 1930s, and second because they form the basis for receiver calibration, a feature necessary but conspicuously absent on practically all pre-WW-II amateur receivers. Picking through junque boxes at hamfests and radio flea markets will usually produce some OT-frequency crystals if one is persistent. Alternatively, crystals may be purchased reasonably through makers who advertise in *QST* classified ads. One certainly does not need to have more than a few crystals for each band. Calling or answering another contestant off his frequency by as much as 20 kHz is more fun, more challenging, and more representative of prewar operating technique.

A 6V6 (1937) was chosen as the oscillator tube mainly because the same tube was going to be used in the final stage, and because I had a quantity of new ones on hand! A 6J5 triode or 6F6 would work as well. The Pierce crystal oscillator, an adaptation of the ultra-audion circuit, was one of the earliest used by amateurs. It requires no tuning control or plug-in coils and thus was chosen for its



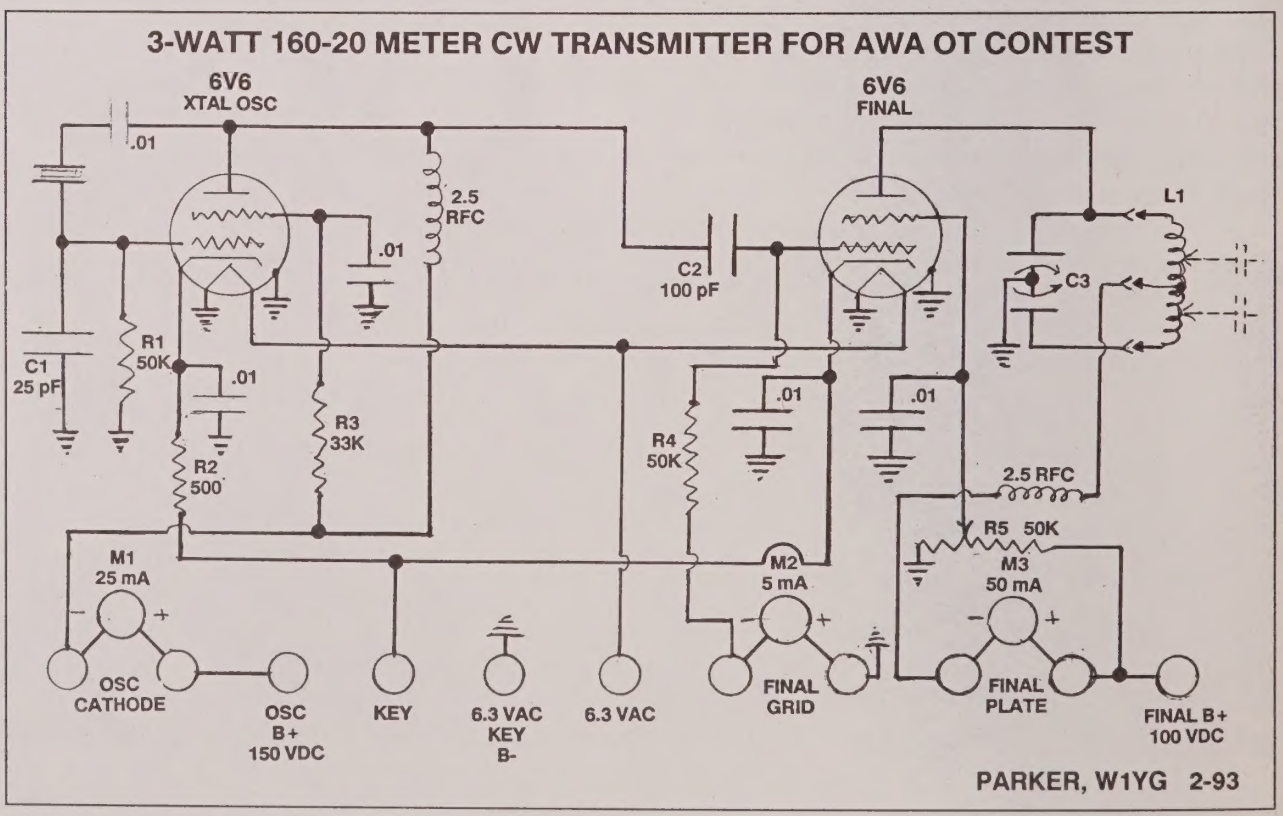
simplicity. The absence of a tuned output circuit provides the additional advantage that the output stage does not require neutralization. It is important to note, however, that the Pierce circuit will oscillate only at the crystal's fundamental frequency. Although various pre-WW II literature and construction articles indicate that 20- and even 10-meter fundamental crystals were in use at the time, I have never been able to find one. Even the Bliley HF-2 style 20- and 10-meter crystals are not fundamental types but are third-harmonic crystals, meaning that when used in the Pierce circuit, they will oscillate at one-third the 20- or 10-meter frequency stamped on their nameplates. For this transmitter, fundamental crystals are used for 160, 80 and 40 meters; however, for 20-meter operation (unless one has 20-meter fundamental crystals), it is necessary to use a 40-meter fundamental crystal on one-half the desired frequency and to double in the output stage.

The oscillator circuit is straightforward except for the feedback condenser C1, which is discussed under "testing and de-bugging" below. Grid bias is obtained using a combination of grid leak R1 and cathode bias resistor R2. The plate supply is 150 V regulated, and the screen voltage is obtained through dropping resistor R3. The cathode current is monitored by M1 and the cathode is returned to ground through the key, along with the cathode of the 6V6 final tube.

FINAL OUTPUT CIRCUIT

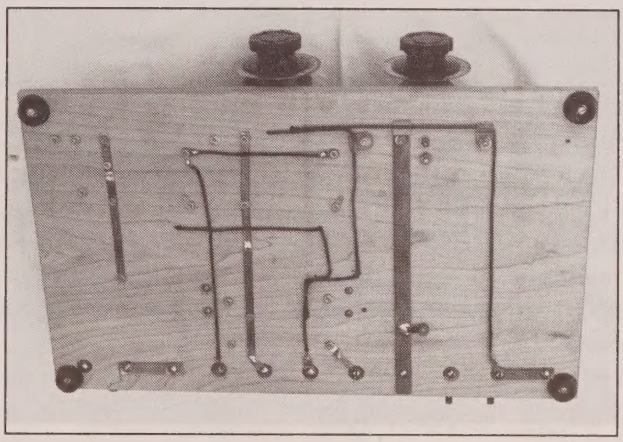
Grid drive from the crystal oscillator stage is obtained through coupling capacitor C2. Grid bias is obtained by grid leak R4 which is returned to ground through the grid-current meter M2. An important feature of this transmitter is the screen dropping resistor R5 which is a 50,000-ohm potentiometer. This is used to control the plate current, and hence the power input to the final stage. Another important feature is the balanced output tank circuit. I have found that the most efficient method of getting RF into an antenna fed with balanced open-wire feeders is by using a balanced tank circuit directly connected, through blocking condensers, to a balanced pi-section antenna impedance-matching network. Hopefully, this will be the subject of a future *OTB* article. If one is using a single-wire-fed, Marconi-type antenna, then the balanced tank circuit is not necessary. For this transmitter, a condenser with 500 pF per section would be the best choice; however, the only one I had at hand had 350 pF per section. To one building this rig, I strongly recommend the former, which should not be hard to find since a two-gang receiving type with identical sections is adequate.

The final tank coils are air-wound for two reasons: first, *efficiency*, and second because they are easier to tap into and adjust for connection to the antenna-matching network. For simplicity, I wanted only two coils for the four bands. This job will be much easier if one uses a tuning condenser with 500 pF per section. My 20/40-meter coil consists of 14 turns of ¼-inch copper tubing, 3" OD, 2 TPI, and easily resonates on both bands with capacity to spare at each end. The 160/80-meter coil uses 40 turns of #14 tinned copper wire, 3" OD, 6 TPI, and just barely makes resonance on each band with little capacity margin. Plate voltage is fed via the plate-current meter M3 through an RF choke to the center tap of the tank coil.



CONSTRUCTION

The transmitter is built on a 10" by 17" by 3/4" thick maple board which is chamfered, sanded and shellacked. A metal chassis would also have been appropriate for the period, but I have a fondness for wood. Several layouts were experimented with before arriving at the one shown. I wanted to have a neat-looking symmetric arrangement, with as few wire crossings as possible. This was achieved by mounting several ¼-inch wide copper straps to which ground returns could be connected conveniently, and also by having some of the wiring below the board which, in turn, is held above its mounting surface by rubber feet. Eby bakelite breadboard sockets were used for the tubes and crystal. Isolantite or ceramic sockets would have been preferred, but again, parts availability prevailed. To further enhance cosmetics (not function), all fixed condensers are Sprague Type 12 micas, although, given the low voltages involved, almost any type will work. Along the back edge of the board are mounted 11 binding posts made up using 10-32 round-head machine screws, nuts, washers and brass knurled thumbnuts, all of which are available at most hardware stores. Five of these are actually used as connection points, and six are used to support the meter brackets which are made from copper straps ½" wide by 1/16" thick. The plate tuning-condenser shaft extension and the screen potentiometer are mounted on 1/16" thick aluminum brackets and the plate tank coils plug into ceramic "beehive" insulators using General Radio "banana" plugs and jacks.



TESTING and DEBUGGING

After wiring and checking out all connections, the key and the required power supply connections were made to the binding posts, namely, 6.3 VAC for heaters, 150 V regulated for oscillator and (using a variable supply) 150 V to the final stage. After heater warmup, a 160-meter crystal and the 160/80-meter tank coil were inserted and the oscillator plate supply energized. Closing the key showed approximately 15 mA of oscillator cathode current and about 0.5 mA grid drive on the 6V6 final. Monitoring on the crystal frequency indicated a pure-DC crystal tone and excellent keying characteristics. Next the final plate supply was energized and adjusted to 150 V. Depressing the key resulted in the final plate current off-scale on the 50-mA plate meter, so the voltage was reduced to 100 and the screen potentiometer adjusted to give an off-resonance plate current of 30 mA. Tuning the plate tank to resonance produced a sharp, deep dip in plate current. Using an 8-volt, 250-mA bulb (approximately 2 watts at full brilliance) connected to a two-turn pickup loop, the tank was loaded and showed relatively good efficiency by lighting the bulb to near full brilliance. These tests were repeated on the 80- and 40-meter frequencies with equally satisfying results. The only significant change in parameters was the crystal current (which was being monitored by a temporary 0-100 RF milliammeter), which varied directly as the crystal frequency. These currents were approximately as follows: 160-meter crystal, 10 mA RF; 80-meter crystal, 25 mA RF; and the 40-meter crystal, 35 mA RF. All rather low, but since the rig seemed to be working perfectly, I didn't give it a second thought. Up to this point, everything was going smoothly and there remained only one more bench test to be done, to check the 20-meter operation using a 40-meter crystal and doubling in the final stage. This is where trouble and frustration were encountered for the first time. When the plate tank was tuned to resonance at 20 meters, there was a slight rise in plate current instead of a pronounced dip. A frequency counter proved the tank circuit was oscillating at twice the crystal frequency but the makeshift "wattmeter" barely glowed, showing extremely low efficiency. I tried everything I could think of, including: new tubes, varying the oscillator grid leak using a potentiometer, different crystals, higher voltages on the oscillator, different values for coupling condenser C2, and higher and lower plate voltage on the output tube. Nothing gave efficient doubling in the output stage.

I decided to re-read the literature on the Pierce crystal oscillator, noting again the low output obtainable and the fact that the oscillator needed the feedback condenser, C1, to function, although its value was not critical. Perhaps the low output was just not enough to drive the 6V6 efficiently as a frequency doubler to 14 MHz and I was barking up the wrong tree.

Since the oscillator was working perfectly otherwise, the feedback condenser C1 was not suspected, particularly since its value was not "critical." As a last-ditch effort, I decided to change C1 to a somewhat higher value than the 100 pF originally used. Having disconnected it from the circuit, I was curious to see what would happen without any condenser installed at all. Much to my surprise, the oscillator performed exactly as before! Next I

checked the condenser and found it to show zero on my capacity meter. So much for the need for a feedback condenser. Now I wanted to see what the effect a feedback condenser would have, so I installed a variable condenser which measured 13 to 110 pF. With the 40-meter crystal in place and the condenser set at minimum value, there was no change in parameters; however, as the capacity was slowly increased, there was a dramatic increase in crystal current until at 50 pF, the crystal current reached 100 mA and the grid drive reached just over 1 mA. I did not proceed higher since I felt that over 100 mA RF current could fracture the crystal. Next the output tank was checked for frequency doubling and found to exhibit a pronounced dip at resonance with the light bulb wattmeter showing full brilliance. At last we were getting somewhere! A little experimenting showed that a setting of the feedback condenser of 25 pF reduced the crystal current to 70 mA with grid drive at 0.75 mA and acceptable efficiency when doubling. Operation with the 160- and 80-meter crystals was unchanged except for a proportionate increase in crystal current (22 mA for 160 and 50 mA for 80).

CONCLUSION

The transmitter loaded up nicely through the previously mentioned antenna matching unit. 100 V and 25 mA plate load on the output stage seemed to work best and maintained the plate input power below the 2.99 watts for the QRP category. On-the-air checks on all four bands showed that this little rig was doing everything that could be expected of it - and more!

The good news was: I finally had what I wanted, a high-efficiency, 3-watt input transmitter, operating on 160 through 20 meters with the simplicity of only one tuning condenser and two plug-in coils! The bad news: the OT contest was half over by the time I got it. Watch out for this little 3-watter in 1994, guys!

73, Parker, W1YG

THE NFWA-AWA AUGUST MEET

Larry Babcock
8095 Centre Ln., E. Amherst, NY 14051

The 1993 Niagara Frontier Wireless Association meet, at the Amherst Museum near Buffalo, was a great success, thanks in part to support by AWA. AWA had provided the local club with address labels covering its members in western New York, so NFWA sent a postcard reminder to each. Three AWA staff members attended, giving additional support. Lauren Peckham was the speaker, Ed Gable set up in the flea market, and Bruce Kelley provided a very salable radio for the donation auction.

This annual event was held August 14 on a mowed grassy field in a country setting. About 100 collectors attended and there was active buying in the flea market.

The highlight of the day was an informal talk by Lauren Peckham. His love besides radio is automatic mechanical music instruments of 1880-1920 vintage, and he brought a fine collection of them to talk about. These devices were used in the home for musical entertainment before the days of radio, so the subject was appropriate and well presented with a demonstration of each. One that I had never seen was an ornate snuffbox-sized instrument. In it a tiny bright-colored inch-long bird jumped up, flapped its wings, turned, opened and closed its mouth, and bobbed up and down while singing beautiful bird calls. All this was coming from a 1" x 2½" x 4" decorated gold box! Peckham said these devices are very rare and valued about like a good Catalin radio.

Attendance was about equally divided between local people and those who came several hundred miles. There were several Canadians, including one from Montreal. One collector from France drove from Connecticut. He was happy to find a Radiola III with good WD-11s and Murdock headphones. I collect Branston items because they were made locally. I found my first pair of Branston 'phones, and now need the radio to go with them!

There were two auctions. The donation auction benefitted NFWA and the trunk auction was to help flea-market items find new owners. There were a lot of bargains at both.

Several tours were conducted into the Amherst Museum's "Hall of Communication." This room contains the Museum's permanent display of early radio and an NFWA exhibit of Federal radios behind an old radio storefront (August *OTB*, p. 60). Each of the earliest Federals was displayed, along with Federal parts, radios home-built with them, artifacts from Buffalo's first radio station (owned and operated by Federal at its plant), and a mid-'20s radio-service bench. The exhibit changes annually, so next year you will see an all-new display of radio antiques.

There was a much interest in the equipment contest. The "radio with matching amplifier" class was won by a Grebe CR-5 with RORN and RORK RF and audio amplifiers. The best "novelty" was a cute jewel-box set. An unusual Majestic cathedral won the "AC radio" category and the "speaker" class went to a Murdock megaphone horn.

If you weren't there, you missed a good one but there is always next year - I hope to see you then!

NEW MEMBERS

AWA welcomes the following collector-historians. We list all new members routinely - if your name does not appear within six months, please advise the Editor. If you do not wish to be shown, just mark the application form accordingly. AWA does not provide an address list or other directory of its membership.

Allan **Anderson**, NY
Joe A. **Bailey**, NY
Robert D. **Bates**, N2JEY, NY
Charlie **Bautsch**, K5UPX, TX
Philippe Albert **Beauvillain**, France
Joseph S. **Bentrovato**, FL
Steve **Berg**, KB4IRB, FL, USN radioman
Herman **van den Berg**, PA3BFH, Netherlands, ship op., 1972-87
Scott **Birkby**, N2QLT, NY
Richard F. **Blinzler**, NM, WGR
Allan R. **Bowen**, KA2GKM, NY, electronic engineer, Kodak
Cloyd L. **Briley**, CA
Donald G. **Brooke**, WA2ELD, KY, Westinghouse, Litton, Hughes
Dan **Brown**, MA
Bruce **Burgess**, WX1O, VT
Rain **Buttignol**, NH
Kevin **Carey**, WB2QMY, NY, columnist, *Monitoring Times*
Peter J. **Carney**, CT
Stuart J. **Carter**, II, W4NHC, FL
Joseph Casal **Casal**, C37LU, Andorra
Douglas T. **Cheney**, CT
Buford B. **Chidester**, PA
James A. **Chisman**, SC
Clinton G. **Conover**, PA
Paul D. **Cooper**, NY
John **Cornforth**, UK
David **Coursey**, CA
Gary L. **Cunningham**, MI
Donald D. **Dawson**, N2CQB, NY
Joel **Delmonico**, NY, sales mgr. WSYR, WYYY, WBBS
James **Dillon**, AK
Steven **Dimattia**, MD
Takashi **Doi**, Japan
Harold **Driscoll**, NY
Jerrold L. **Dykstra**, IL
Bryan A. **Ensley**, K4UYR, VA, radiotel. stn. KFL935, WGAI, NC; CAA (FAA)
H. Mike **Farmer**, ON
Frank C. **Fernandez**, CA
Charles R. **Filer**, Jr., FL
Kenneth M. **Fullerton**, OH
Mario **Ganio**, CO
Robert E. **Garrett**, NU2P, NY
Carroll E. **Garrison**, VA
John H. **Gibson**, NO8V, MI
Vince **Giordano**, NY
Henry L. **Grant**, N2FBU, NY
Peter W. **Grave**, PA
Sylvain **Gregoire**, PQ
Richard L. **Gysen**, NC
Jon B. **Hagen**, WN2M, NY, Cornell University, Arecibo Observatory (radio telescope)
Robert **Heiman**, IA
Ray **Hennington**, TX
Jeffrey R. **Henry**, N3GLY, PA
Douglas R. **Hershberger**, NY
Mark W. **Hilliard**, N3NBC, PA
Richard J. **Holley**, KA2GCP, NY, NY ANG, radio repair
Clifford R. **Huff**, TX
Walter V. **Hynes**, NY
Stephen S. Jakubiec, KY
Carsten Jensen, Denmark
C. William Johnson, GA
Harry L. Jones, N2GTX, NY
Alan Karpinski, NY
Jonathan S. Katz, NH
James E. Kearman, CT
Daniel L. Kerl, AL
Howard A. Krinsky, CA
Andrew J. Kuchinsky, MA
Robert L. **Larson**, OR
Jeff Latz, KA0ARW, KS, radio op. KS Nat. Guard
Rod **Lauman**, VT
Fredric M. **London**, AZ
Kevin L. **Mack**, CT, KUOP-FM, program director
Bernard **Magers**, MO, AT&T Microelectronics (WE)
Peter J. **Malvasi**, WB2BYQ, NJ
John N. **Mann**, OH, ret. ind. electronics, mfg. plant
Robert A. **Marks**, NY
Charles A. **Marttila**, N0VNC, MN
Brian **Mattson**, K8BHZ, MI
John **Maynard**, VE3UCS, ON
Mike W. **McClanahan**, TN
E. Millis, TX
Gregory J. **Mitchell**, IA
Roberto **Molinini**, Italy
Thomas **Monahan**, WA2ZWE, NJ
Robert C. **Mooney**, NY
Joseph L. **Morris**, MD
Stephen **Musser**, GA
Robert A. **Napoli**, NY
Steven **Nutt**, N9ELJ, IL
William J. **Orr**, VE3CRN, ON, Royal Canadian Corps of Signals, National Research Council
Oscar **Padron**, NJ
T. F. **Parrish**, GA
Ivan **Pascal**, DE
Piotr **Paszkowski**, Poland
Stan **Paulson**, SK, CFQC-TV
Francis X. **Pellicano**, RI
John **Petrich**, W7HQJ, WA
John J. **Pittari**, GA
Rick **Plume**, ON
Jarry **Proc**, ON
Claude G. **Rainville**, BC
Thomas J. **Rayner**, NY
Boris **Real**, F5TFS, France
Robert **Renkar**, CT
Gary **Royal**, NC, Gary's Radio & TV, owner
Michael B. **Ruggiero**, W2NVR, PA, SigC, US Army, telecomm consultant
Anna **Schauer**, KB5MYY, NM
Robert W. **Schmitz**, MD
George **Schwarz**, OH
Jim **Seaton**, W1FWE, CT, U. S. subs, sub base, New London
David **Shapiro**, GA
Melvin **Sherman**, CT
Richard **Sherman**, WZ2T, NY
George B. **Shields**, Jr., NJ
Gary W. **Sims**, KS
John **Slusser**, WF2W, NY
Leroy E. **Sparks**, W6SYC, CA
Marvin **Stacy**, FL, Philco, Arvin, Hallicrafters, Zenith
Harriet **Stanton**, NY
Cliff **Stoll**, K7TA, CA
Lynn D. **Stolz**, N8AJ, OH
William W. **Summer**, MO
David **Swartz**, MO
Alex R. **Taranko**, NY
James D. **Tasa**, NY
Normand R. **Thibault**, W1AUT, MA
Conrad **Trautmann**, NY, WSYR, WWY, WBBS
Tom **Vaughn**, IN
Eric D. **Wachtel**, NJ
John W. **Wagner**, W8AHB, MI
Leo **Wallace**, TC
James A. **Warner**, VT
Frederick L. **Watson**, KB8NRF, OH
David J. **Wawro**, NY
Edward **Wesolowski**, DE, Comm. & Network Services
Clifford **Wiehr**, K8GLM, Mich.
Bradford M. **Wilson**, KA1GDG, MA
Christopher R. **Wincey**, PA, ret. ship operator
Philip E. **Winters**, K8THT, OH, Gray Hist. of Wireless Museum
C. W. **Wolfe**, MT
Daniel H. **Wood**, NY
Arnis **Zarins**, ON

THE MAILBAG

Readers' comments on early radio topics are welcome. Because of space limitations, letters that are published may have to be edited. Send all material to the Editor.

COVERING THE BASES

Since the note "Fixing Loose Tube Bases" appeared in the August issue, a correspondent suggested using the original "Crazy Glue." It is very fluid and is quickly absorbed into the original cement. I did try this when "Crazy Glue" was first marketed (about 15 years ago?). It does work - for a time varying from a week to perhaps five years. However, the glass envelope will again become loose because acrylonitrile cements do not adhere well to polished or very smooth surfaces (which the glass envelope certainly is). Also, it does not work if there is any appreciable gap to be filled. **Rex C. Byle, WA9JWT**

PRESERVING "SPARKS"

I am responding to an article by Robert M. Morris in the May *OTB*, entitled "600-Meter Marine Radio Distress Watch Bows Out."

The U. S. Coast Guard ended their 500-kHz watch this August, but that action has nothing to do with the watch by commercial coast stations or merchant ships. Mr. Morris' conclusion that "the shipboard radiotelegraph operator becomes history" is not yet true.

I am a shipboard radioteleraph operator *now*. The system that is to replace 500 kHz, called GMDSS [Global Maritime Distress and Safety System], is to be phased in between 1992-99. It is not until 1999 that the radiotelegraph station is supposed to be removed, because the world's ships do not have to comply with all the elements of the GMDSS until 1999.

U. S. shipowners want to eliminate the radiotelegraph station and implement GMDSS as soon as possible. But the 500-kHz radiotelegraph system and the new GMDSS are not compatible. A large number of the world's ships are expected to be sailing with radiotelegraphy until 1999, when they will have to adopt GMDSS by international law. It is not easy for a GMDSS-equipped ship and a radiotelegraph ship to communicate with each other. The radiotelegraph distress system must be maintained on U. S. ships until GMDSS is fully phased in.

There is a bill, Senate Bill S.786, which if passed would add language to the Communications Act of 1934 allowing the removal of the radiotelegraph station and radio officers from U.S. flag ships before GMDSS is fully implemented. I know this bill is of interest to readers of the *OTB*, and I encourage them to contact their senators and express their opinion concerning Senate Bill S.786.

This bill must not pass. Removing the radiotelegraph stations and radio officers from U. S. flag merchant ships *before* GMDSS is fully phased in would endanger the safety of our ships at sea. I would appreciate if this letter could be published in the *OTB*. **Richard Monjure**

The new legislation adds to the Communications Act a new exemption from equipment requirements, via a §352(a)(5), inserted as follows:

> *"(5) A United States ship operating in accordance with the Global Maritime Distress and Safety System provisions of the Safety Convention"*

CLEANING ALUMINUM - NO L[Y]E

With regard to cleaning aluminum chasses and parts, Zep Products, an industrial solvent and cleaning-supply company with sales reps nationally, makes an excellent concentrated cleaner. I am in the auto-salvage business and we use it to clean the bodies on our trucks. It cleans so well that even battery-acid stains are removed. I would highly recommend it. **Pete Grave**

There is a safer alternative to lye for cleaning aluminum. At Benthos we use a product called Alodine for coloring aluminum, where there isn't time to send it out for a really good finish, or when it must be conductive (anodizing isn't). The pieces come out yellowish, like the chromate conversion coatings you see. Anyway, the maker also sells a cleaner to use first. It comes in a gallon jug and is diluted with three parts of water for ordinary freshly machined aluminum, or can be used straight. ["Alumiprep 33 Cleaning and Conditioning Chemical," Amchem Products, Inc., Ambler, PA 19002]. It etches the aluminum, like lye, more slowly and evenly. There's a minimum order, but I thought I'd at least point out that it exists.

In the May *OTB* I noted my old tip on repairing celluloid horns. The repair is still holding [after 20 years], but the reconstituted celluloid shrank somewhat after it was installed, so if I were to do it again, I'd let the piece dry for a longer time before using. **Alan Douglas**

RECENT RADIO AND ENTERTAINER OBITUARIES

Charles Griffen, W1GYR
1225 New Britain Ave., West Hartford, CT 06110

Albert L. Borkow, 88, a developer of magnetic-tape audio recording. Starting at the Eastern Specialty Co., he later founded the Magnetic Recorder and Reproducer Corp. He recorded the Sunday concerts of the Philadelphia Orchestra for 20 years and developed techniques for merging recorded music with live peformances.

Julius Cohen, 79, ex-president of Cohen, Dippell and Everist, Washington broadcast-engineering group with major multi-station clients. In the broadcasting industry from 1942 to 1992, he was president of the Association of Federal Communications Consulting Engineers (AFCCE) and a life member of the IEEE.

Edward Davis, 68, co-owner of Sundial Broadcasting Corp. (KDFC-FM, San Francisco; KDFC-AM, Palo Alto). He and his partner, William Crocker, acquired KDFC (then KIBE) in 1948. KDFC-FM was one of the first stereo stations.

Rosel H. Hyde, 92, former chairman of the FCC. Joining the staff of the Federal Radio Commission in 1928, he helped shape regulatory policy for broadcasting and cable during a 41-year career; became a commissioner in 1946. Retiring from the FCC in 1969, he went into practice with the communications law firm of Wilkinson, Cragun & Barker.

Robert E. Lee, 81, retired FCC commissioner. Serving from 1953 to 1981, he championed use of the UHF channels, heading the FCC's Committee for the Full Development of All-Channel Television, and of color TV.

Edward Shively, 67, antenna pioneer. He led development of antennas and combiners for FM and TV broadcasting for RCA during the 1950s; then headed engineering for Dielectric Communications and founded Shively Laboratories in Bridgton, ME. In 1980 he sold the firm to Howell Laboratories, Inc., staying as a consultant for eight years.

James Weldon, radio engineer; founder and past president of Continental Electronics. He began as chief engineer of a station in Topeka. Later he built the 500-kW transmitter for "border blaster" XER in Villa Acuña, Mexico. His transmitter was the first to use the Doherty high-efficiency amplifier at that power level, using eight of the then-new WE 320A tubes. (Only nine were ever made.) After WW II he started Continental in Dallas. In 1959 he sold the company to Ling Electronics but repurchased it in 1972, expanding by purchase of the Collins AM-FM product line from Rockwell. Continental was later acquired by Varian Associates.

SILENT KEYS

(AWA members, with or without amateur licenses)

Oscar Hauger

Edward W. Herold, retired vice president for research at RCA, IRE Fellow in 1948 for work in tube development, recipient of the IEEE Founders' Medal in 1976 for leadership in color-TV development, and winner of AWA's 1993 Tyne Award for *OTB* - Review tube history. (LAS)

Arthur W. Kelly, W2ROB (1913-93). AWA lost a valuable board member and assistant curator when Art died suddenly on July 13. A radio amateur for 60 years, Art was a professional with Rochester's pioneer station WHAM, from which he retired as general manager. He served as museum guide co-ordinator and assisted other activities. (BK)

Sid Prior, Canadian radio historian

Leigh Robartes, W2EHA, AWA Museum guide

David White

Robert F. Youhas

Lincoln Thompson, Sr., 92, inventor. He started as an engineer at Victor Talking Machine Co., Camden, NJ. At the Bristol Co., Waterbury, CT, he helped develop "talking pictures." In 1954 he joined Raymond Engineering Inc., Middletown, CT, as VP with special expertise in tape recording, becoming president-CEO in 1961. The firm made spacecraft recorders for NASA and magnetic-tape units for IBM flight computers that guided the Gemini spacecraft. He held 47 patents, with several for sound movies and electronic amplifiers, and is credited with development of "talking book" records for the blind.

Bernard Peterson Kardon, 79, chief engineer of Harman-Kardon, Inc. With Sidney Harman, he started the company around 1950 and handled design and manufacture of their hi-fi audio equipment. Retiring from the firm in 1959, he worked as a consulting engineer for Premier Microwave Corp., a company founded by his father. He was also chief engineer and production manager for David Bogen Co., maker of public-address and other audio systems.

Brad Phillips, 74, radio newscaster at WINS in New York, 1948-92. He had begun his career at the station as a disc jockey. Covering the 1948 Truman-Dewey election, he remained on the air for 23 consecutive hours.

Thanks for source material to Thomas Traks; Mike Parker, KB7RSS; Donald King, W1YCW; and Paul Bohlander, W3VVS.

CLASSIFIED ADS

Old-time ads are free to members collecting and restoring equipment for personal use. **The rules:** (1) one ad per issue per member; (2) include an SASE if acknowledgement is desired; (3) material must be over 25 years old and related to electronic communication; (4) give your full name, address, and ZIP code; (5) repeats require another notice - we aren't set up to repeat automatically; (6) the Association is not responsible for **any** transaction; (7) we retain the right to reduce the size of the ad to fit space; (8) AWA does not accept commercial advertising; (9) deadline to receive ads for the February issue is December 4; later arrivals will be held for the following issue. Mail **all** ads to: **Richard Ransley, Box 41, Sodus, NY 14551.**

SELL/TRADE - BC/SW TUBE RADIOS

Bosch 5B, $75, pickup only; Majestic 72 cabinet only, $75, pickup only; RCA 6BX63, lens cracked, $45; GE C550F chrome & black, $35; Philco 38-4, $75; Norelco EL 3528A R. R., no lid, $20; Knight KG-635 DC scope, $35; Knight KG-690 sig. tracer, $35; Truetone D-784, $45. All are in wkg. order. Shipping extra. Robert Rossi, 10936 Melbourne, Allen Park, MI 48101.

First postwar RCA television (1946) console. Historic piece. Best offer or will trade for a color wheel. Fred London, 3716 South Country Club Way, Tempe, AZ 85283, (602) 345-1091.

Philco '37 37-690, 300-lb. console, 20 tubes, 7 speakers, two chasses, 15-watt audio, p-p 6B4s, "magnetic" tuning, 5 bands. Pickup only. Taking bids. Francis Yonker, W2IBH, 1229 Inverary Place, State College, PA 16801, (814) 867-1400.

Westinghouse RC: RA tuner, DA detector, single cabinet. 3-tube WD-12 brass-base, fil. OK. Made in Canada by Canadian Westinghouse Co. $450 U. S. Marcel Vallee, 703 Boul. St. Germain, Rimouski, QU G5L 3S6, Canada.

SELL/TRADE - COMM GEAR

Collins mechanical filters, 500 kHz, 9.4-kHz BW (500F94), NIB, $20. Also have 500-kHz CW filters and others down to 76 kHz center freq. Hank Olson, W6GXN, 1751 Croner Ave., Menlo Park, CA 94025, (415) 326-8149.

Hallicrafters SR-75 in good cond., with original manual, $90 plus UPS. R. Gordon Graves, 5701 Pimlico Rd., Baltimore, MD 21209, (410) 466-2979 evenings.

National HRO, S/N #198, uses 2½-V tubes. Includes 5897 6-V heater pwr supp used with aux xfmr for replacement 6-V to 2½-V tubes. Intended for AWA OT contest, stored for 3 years. 1960 letter from National assured owner "you will certainly have a collector's item," as it was the 198th rcvr manuf. SASE for replies. Alexander McKenzie, W1BPI, P. O. Box 38, Eaton Center, NH 03832.

Swap working SW-3, 6 coil sets, 4GC/2BS, for 75A-4 or HQ-180. SASE please. Bill Plimpton, RD 6 Box 264, Wellsboro, PA 16901.

SELL/TRADE - GENERAL

AT&T TTY, #19; 1914 signal buzzer; 1943E German field phone; Dinshab Spectro-Chrome Metry; 13" Paillard music box; 8 typewriters; 40 quack devices; 45 Ampico rolls and 450 boys'-series books (avg.). Will sell or trade for commercial spark xmtr and rcvr, magnetic detector, Fleming valve and stock-ticker. James Chisman, P.O. Box 1111, Clemson, SC 29633, (803) 639-2939.

Marconi magnetic detector in exc. cond. London model. Photo upon request. R. Brewster, 454 Diablo Dr., Pittsburgh, PA 15241, (412) 833-4287.

RCA 211K 11-tube console; Hickok 209 electronic VOM-capacity meter; Radio City 310 tube tester; Masco ME-18 audio amp; TS-1/ARR-1; Webster Chicago 80-1 wire recorder; miniature type tubes. Timothy Yang, 5 Rebecca Drive, Apalachin, NY 13732, (607) 625-5288.

Tubes, schematics, service notes, Riders, etc. for early radios. LSASE for price list. Sam Faust, P. O. Box 94, Changewater, NJ 07831.

SELL/TRADE - LITERATURE

Collection of books, manuals, magazines and catalogues relating to old radio, TV, SW, broadcasting, hi-fi, and service. Also many bakelite and cathedral radios. SASE for large list. Bill Rolf, 30131 Center Ridge, Westlake, OH 44145, (216) 871-4547.

Encyclopedia of Cathode-Ray Oscilloscopes and Their Uses, Rider-Uslan, 1955, 998 pages, includes over 100 scope schematics. $27.50 firm ppd. Instructional test record for use with Sound Craftsmen audio-freq equalizer #BVRS 1156-11, $10 firm, ppd. Jim & Nadiene Farago, 4017 42nd Ave. So., Minneapolis, MN 55406, (612) 722-0708.

Manuals: Hallicrafters FPM-200, RCA 162C Rider Chanalyst, RCA WT-100A tube tester, Solar CF capacitor tester, Hickok 870 dynamic transistor tester, Sylvania 134 Polymeter, Tektronix 517 scope. Tad Dragoski, N3JZQ, 507 Coal Valley Rd., Jefferson Boro, PA 15025, (412) 466-5950.

SELL/TRADE - TESTGEAR

Dero Electronics PT-1 pix tube ckt tester for B/W sets using large-base picture tubes. Unusual and compact (3" x 1½"). Plugs into pix-tube socket; uses 6AF6 eye tube to test htr. & first-anode voltage, bias and video signal. $12 ppd. Ken Greenberg, 4858 Lee, Skokie, IL 60077, (708) 679-8641.

Superior Electric S945 Powerstat, 420 Hz, no knob, $5 plus 5 lbs. UPS; Signal Corps "chest set" SC9248J, new cond., $5 plus shipping; GE "Multi RC-Box" ca. 1947, $10 plus 20 lbs. UPS. John Uscinowski, RR #1, Box 379, Greenwich, NY 12834.

SELL/TRADE - TRANSISTOR RADIOS

MCE MCE-2200 AM-FM floating radio, $10. Michael Morrell, RT 2, Box 5024, Williston, FL 32696.

SELL/TRADE - TUBES & TRANSISTORS

12 Eimac 4CX350 (JAN 8321), NIB; 7 8298A (6146B), NIB; Surplus Radio Conversion Manual (Vol. 1); xmtr cartridges (NIB) for WE 626A mic; 19 set spares metal box with tubes. Coloured music box by Electro Home and Zenith grandfather clock radio. Gordon Wilson, 11108-50 Ave., Edmonton, AB, Canada T6H 0H9, (403) 434-6257.

Large selection of tubes starting 1920s. Also adapters. SASE for list. Bob Husted, 270 NW 3rd Ct., Boca Raton, FL 33432.

Tube collection for sale. UY-224s, UY-852, de Forest, Signal Corps VT-1 and many more. Old test equipment, meters, xfmrs for old Philco radios. SASE for list. Arnie Smith, 65 Glenwood Rd., Upper Montclair, NJ 07043.

WANTED - COMM GEAR

Collins 51J-1 to -4; National HRO-5A2 coils F, H, J, speaker; HRO-50 coils F, G, H, J; HRO-60 dial scales G, H, J; HRO receivers; also E. H. Scott radios; trade HRO-60 spkr for HRO-5 spkr. Carter Elliott, 1460 Pinedale Rd., Charlottesville, VA 22901, (804) 979-7383.

Drake SW-4 or SW-4A rcvr. David Lowenstein, N7AF, 236 East La Jolla Dr., Tempe, AZ 85282.

Hallicrafters DD-1 amplifier section, P/S section, meters or complete receiver in any cond. RCA Model AVR-11C, AV-11. HRO coil, speaker, P/S in any cond. John Orahood, 5819 Miller Valley, Houston, TX 77066, (713) 440-5598.

Speaker for Drake 1-A rcvr. Will also consider speaker and rcvr. Dave Noon, VE3IAE. 19 Honeysuckle Dr., London, ON, Canada N5Y 4P3.

WANTED - GENERAL

Antique and collectable medical, scientific and optical devices. Also static machines such as Wimshurst. Richard Cane, 1333 N. W. 127th Dr., Sunrise, FL 33323, (305) 846-7116.

Old weather eqpt; rcvrs, amplifiers, wind-speed, wind-direction indicators, manuals, catalogs, etc. G. G. Barber, POB 206, Elizabeth, CO 80107.

Early crystal sets, wireless, telegraph, spark gap, rare loose couplers, slider coils, condensers, detectors, keys, sounders, books, magazines. Dick Kowalski, 32823 Gloede Dr., Warren, MI 48093.

WANTED - INFORMATION

"House organs" or catalogs from makers of lab test gear (H-P, Boonton, Stoddart, etc.), esp. with details on development of certain models. Manuals (or selected info) for H-P 410C VTVM, 4260A RLC bridge, 803A VHF bridge, Texscan VS50 sweep gen, URM-26B UHF sig generator. Pre-1925 *Patent Gazettes*. Alan Douglas, Box 225, Pocasset, MA 02559.

Info, schematic, etc. on 1925 battery radio called The "Bonnie" DX Super Harmonic Receiver, made by the Radio Shop, 610 Court St, Ottawa, IL. Any info helpful. Thanks! Frederick Hartnell, P. O. Box 1910, Huntington Beach, CA 92647.

Need characteristics and basing for the following tubes: WE 396A, 404A, 418A; Sylvania 6483. Also schematic for WE KS-15512 L5AB oscilloscope. Rex Byle, WA9JWT, 3312 W. Vera Ave., Milwaukee, WI 53209.

Schematic, instruction manual and tech manual for Realistic DX-160 receiver. Copies OK. Will pay repro & mailing costs. Ed Wyspianski, 523 Tram Blvd., Summervalle, SC 29483.

Tube collector would like to contact anyone having detailed info on, or examples of, Japanese WW II cavity magnetrons, e. g. M312, M316, M60. Rod Burman, P. O. Box 111, Basking Ridge, NJ 07920 or "Kinnagh," Hancocks Mount, Sunningdale, Berkshire SL5 9PQ, England.

WANTED - KEYS & TELEGRAPH

Telegraph keys, esp. mil. and min. (spy-type). Will pay premium price for Bunnell miniature key and sounder. Send description and price. All replies answered. Jim Clark, 4149 E. Hampton Circle, Mesa, AZ 85206-3317.

Unusual telegraph gear from pre-1870, the spark era, and unusual bugs (speed keys). Esp. looking for rare species of bugs like Brown Bros., Boulter, Konkling, Hunter Apex. Have some good trades.

Gil Schlehman, K9WDY, 335 Indianapolis Ave., Downers Grove, IL 60515, (708) 968-2320.

WANTED - LITERATURE

Any book written by Michael Pupin other than From Immigrant to Inventor and The New Reformation. Glenn Stiwalt, P. O. Box 224, Marshville, NC 28103.

Copy of Electricity in Every-Day Life (Volume 2) by Edwin J. Houston to complete three-volume set. Don Bice, 5511 18th Avenue North, St. Petersburg, FL 33710.

Dept. of Commerce amateur station callbooks for 1924 and 1925. Bob Arrowsmith, W4JNN, P. O. Box 166, Annandale, VA 22003 or (703) 560-7161 collect.

Help! I'm doing research for my second book on mechanical television. Must expand my library on this subject and need your help. Looking for textbooks written specifically about TV and pub. prior to 1939, esp. issues of *Television News* mag. (Gernsback pub.). Will pay fair price or possibly make a trade. Any help appreciated. Peter Yanczer, 835 Bricken Place, St. Louis, MO 63122, (314) 822-1748.

McMurdo Silver literature, catalogs, brochures. Have cash or AK paper to trade. Don Hauff, Box 16351, Minneapolis, MN 55414.

Need data on Amertran Deluxe transformers, esp. interstage and driver types W71. Trade or purchase. L. Larsen, 308 Hamilton Ave., Silver Spring, MD 20901, (301) 587-8143.

Riders Manuals #18, #19 and #23 to complete my library. Thank you. Joseph Forth, WA2TRT, 321 Long Vue Acres, Wheeling, WV 26003, (304) 277-3154.

*QST*s before 1923 to complete my collection. Edward White, WA3BZT, 809 Seymour Rd., Bear, DE 19701-1121, (302) 322-1313.

Radio Boys books by Allen Chapman with original dust jackets only. Henry O'Meara, 42 Aqua Ra Drive, Jensen Beach, FL 34957.

Schematic for store light ID-820 or TO-820, made in Japan; also GE tape player 3-51050, made in Korea. 5K ohm volume control with switch and oscillator-antenna tuning condensers. James Maloney, 1703 Leno Road, Macedon, NY 14502.

Will pay top price (depending on cond.) for *Practical Electrics*, Nov., 1921. Also Dec. 1921. Harry Goldman, 3 Amy Lane, Queensbury, NY 12804.

WANTED - MILITARY

WW II Japanese military radio equipment, literature and photographs. Takashi Doi, 1-21-4 Minamidai, Seyaku, Yokohama, Japan.

WANTED - PARTS

Benjamin UV-199 spring-mounted tube sockets. Selectone coils and transformers. Kellogg condensers, working or not. Also interested in any E. H. Scott receiver. John Meredith, 1644 Parkside Circle, Niceville, FL 32578, (904) 897-7734.

Escutcheon for GE radio A-63 upright. Douglas Hudson, 5270 Spring Beauty Ct., Gahanna, OH 43230, (614) 890-2251 after 6 PM.

Faradon variable condenser model UC-1820 to mount on my AG-1380 loop antenna. Trade or cash. Ross Smith, 1133 Strong Ave, Elkhart, IN 46514, (219) 295-7770.

Need Atwater Kent breadboard parts in good cond.. Type 11 AK tuner unit with tag and a three-tube TA unit. Reasonably priced. Bill Duggan, 408 Seaford Ave., Massipequa, NY 11758.

Field-coil speakers with carrying handles and cast frames made by RCA, Jensen, Western Electric, ERPI, etc. Vernon Vogt, 330 S.W. 43rd st. #247, Renton, WA 98055, (206) 251-5420 ext. 247.

Output xfmr for Philco 41-315X, special because it has an 8-Ω secondary with tap at the low end for feedback to the volume and tone controls. P-P primary for 42s. Philco P/N 32-7981M. Also need old-time set of crystals, 452.5 and 457.5 kHz, and ckt diagram for a Grebe socket power supply 671B for rcvrs with 71 tubes in audio. Alton DuBois, Jr., 67 Peggy Ann Rd., Queensbury, NY 12804.

Power transformer for Sparton 591, 593 or 931. 600 V, 5 V, 5 V, 5 V all CT. H. Seesselberg, 22 Christy Dr., Warren NJ 07059.

Restoring a Hallicrafters SX-71. Need medallion that snaps in and covers adjustment hole for carrier-level meter. Round, with letter "H." Wes Chatellier, W5DPM, 1950 Chevelle Dr., Baton Rouge, LA 70806.

Volume control (potentiometer, brown) for AK #4560 five-tube breadboard. Mounting holes are 3-7/16" centers. Paul Newcomer, 32610 Sandra Lane, Westland, MI 48185.

WANTED - BC/SW TUBE RADIOS

Atwater Kent breadboards and breadboard parts. Jim Peters, 983 Chapel Ct. South, Glen Ellyn, IL 60137, (708) 790-9699.

Crosley 37-tube deluxe WLW super-power radio receiver, circa 1936. This huge console receiver has 6 speakers, 4 chromed chasses, stands 4' 10" tall and weighs 475 lbs. Jim Clark, 1292 Starboard, Okemos, MI 48864.

Magic (tuning) eyes wanted. SX-11, S-14, other Skyriders, NC-100X, Silvers, Sargents, RCA ACR-111 and "T" home all-waves and other "eye" radios.

HRO-50 "E" and "F" coils. Jim Dillon, 201 Seward St., Juneau, AK 99801, (907) 586-3223 10-6 PDT.

Philco chassis/speaker for Model 19 or 89 cathedral (pictured Evol. of Radio, pp. 163-164). Have RCA 10K chassis for possible trade. Gary Micanek, 226 Henry Ave., Manchester, MO 63011, (314) 227-7046.

Pocket radios with tubes - U. S., Japanese, or German. Please provide model, cond., price. Michael Schiffer, 2718 E. 10th St., Tucson, AZ 85716.

Restorable Zenith wood table radios, 6S27, 6S128, 6S137, 8S129 and 10S130. Also other brands of cathedrals and tombstones. Basket cases and the most hopeless OK. James Fisher, 344 Harrison Ave., Manville, NJ 08835, (908) 725-7476.

WANTED - TUBES & TRANSISTORS

Prewar German tubes RENS 1284, G354 & L416/D5 (164). Will consider close substitutes. Second two are rect. and output for Volksempfänger VE301. Also need schematic, speaker, knobs and date/model info for 3-tube wood Mende German radio. Overall vintage, style, size, etc. sim. to Volksempfänger. Tube line-up is RGN 1063, RES 964, RENS 1284. German-radio experts, please help! Don Nordenholt, 1509 Cliffbrook Drive, Plano, TX 75075.

SALES ANNOUNCEMENTS

AWA REVIEW

Volume 8 of the AWA Review is now available, along with Vols. 6 and 7. Contents of each are listed on page 6. Price for any volume, postpaid, is $12.50 (U. S. and Canada; $14 elsewhere). To order, send a check payable to "Antique Wireless Association" to AWA, 44 E. Main St., Flemington, NJ 08822-1224.

As an option, many members combine a Review order with a membership renewal on one check, sending it to the Breesport office.

Various issues of the Review are available from the vendors below, offering credit-card convenience while stocking up on books, tubes, or restoration parts. The addresses: Antique Electronic Supply, 6221 W. Main St., Tempe, AZ 85282, (602) 820-5411, fax (602) 820-4643; and *Antique Radio Classified*, PO Box 2, Carlisle, MA 01741, (508) 371-0512, fax (508) 371-7129.

OTHER OFFERINGS

1942 Philco Model 1010 home recordings. Cassette tape of phono records made in early '42 of local radio broadcasts and comments by Philco installer. $5.95 postpaid. SASE for contents list. Ron Boucher, PO Box 541 (GA), Goffstown, NH 03045.

Collection of old scarce tubes. LSASE for list. F. Krantz, 100 Osage Ave., Somerdale, NJ 08083.

Old-time radio shows on tape cassettes. Catalog listing nearly 5000 shows arranged by category and title, $2. Herbert Parsons, Jr., 5 Surrey Lane, Peabody, MA 01960.

Scarce '20s-'30s radio parts, tubes, ballasts, controls, xfmrs, battery eliminators and more. '30s-'40s radio magazines. Rider's TV I-V. LSASE for list. All new and expanded "Crystal Radio Price Guide," now 350 listings, 12 pages, compiled by crystal collector. Just $7.50 plus two-stamp LSASE. Dick Kowalski, 32823 Gloede Dr., Warren, MI 48093.

Schematics: 1920-70 radio, ham, TV, electronic-organ, test gear, Canadian, misc., $5 PPD. For quotes on manuals, send SASE. "If I don't have it, you probably don't need it." Tektronix RM-503 scope manual and other Tek manuals. Alton Bowman, 4172 East Ave., Canandaigua, NY 14424-9564.

BACK ISSUES

The following issues of the *OTB* are orderable via AWA, 44 E. Main St., Flemington, NJ 08822-1224. Prices are $2.50 each postpaid. Index to *OTB* Vols. 1-32 and Review Vols. 1-6, free on request with purchase.

Volume and Number

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34-1	34-3	34-4				

Special-theme issues contain the normal columns and news, plus a core of features on a particular topic area. The number of special-focus pages in each issue is listed below.

40th Anniversary Special ("Best of *OTB*, 1960-82") (33-2, June 1992) - all 48 pp.
Broadcast Receivers (30-4, Feb. 1990) - 12 pp. of 48.
Communication Gear (32-1, May 1991) - 18 pp. of 48.
International topics and equipment I (31-4, Feb. 1991) - 11 pp. of 48.
International topics and equipment **II** (34-3, Aug. 1993) - 20 pp. of 64.
Military equipment (30-3, Nov. 1989) - 17 pp. of 48.
Restoration I (31-2, Aug. 1990) - 20 pp. of 56.
Restoration II (34-2, May 1993) - 17 pp. of 68.
Tubes (31-3, Oct. 1990) - 19 pp. of 48.
Wireless equipment and stations (31-1, May 1990) - 15 pp. of 48.

BOOK AND MAGAZINE REVIEWS

EDITED BY
Bruce Kelley
59 Main St., Bloomfield, NY 14469

HOLLOW STATE NEWSLETTER

Anyone who uses the R-390A, or other high-quality vacuum-tube receivers of the 1950s, will get a lot from the *Hollow State Newsletter*. It's full of news, parts, and tube suppliers, modifications, and technical articles. Approximately eight pages, about three times a year. Subscriptions are $5 for the next four issues, but I recommend you send $38.75 for the set of back issues 5 through 30 also, and the best of 1 to 4. These go back to 1983, but much of the information never gets out of date, and is fun to read. In fact, you'd better plan on not doing anything else when the packet arrives. Publisher: Ralph Senserino, 12072 Elk Blvd., Riverside, CA 92505-3855. - **Alan Douglas**

APPRAISING AUDIOVISUAL MEDIA

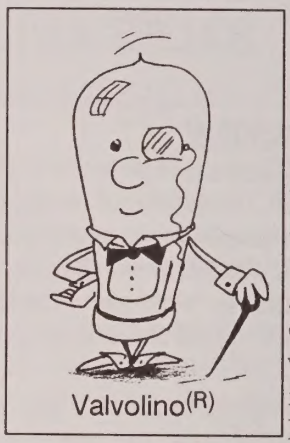
By Steve Johnson, hardbound, 118 pages, ISBN 0-89240-0684, $34.95 + $3 handling, from Copyright Information Services, 1025 Vermont Ave. NW, Washington, DC 20005-3547.

Although this new publication does not deal directly with appraising radio artifacts, it does give the latest authoritative legal appraisal approach to evaluating artifacts and associated problems, with numerous examples. A handy book for one appraising early equipment for legal purposes. - **BK**

ANTIQUE RADIO NEWS

This new English-language magazine, published in Italy by collector-exhibitors Riccardo and Eunice Kron, is an artfully crafted coverage of early wireless/radio history and artifacts. Issue No. 1 (May-June 1993), 48 pages in A4 (8" x 12") format, contains a wide variety of features. There is an eight-page color presentation on 1924-30 console radios, with *magnificent* photography of seven American sets: AK, Garod, Philco, RCA, Zenith. There's a lovely full-page color plate of a 1909 German spark transmitter (looks like a Slaby-Arco). A four-page article covers the public reaction to the 1937 death of Guglielmo Marconi. Another color feature describes the Tingey Unit System (British) receiver, a charming six-module five-tube receiver, which was a sort of de Forest Interpanel laid out horizontally in individual boxes. The various absorption-modulation systems devised by Italian wireless developer Quirino Majorana, involving high-power microphones to modulate an arc transmitter ca. 1908, are in an article of their own. There is a feature on the beginnings of wireless telephony, translated from a 1923 French periodical. A writeup covers the 1992 Archeofon exhibition of antique radios held in Bassano del Grappa. Space is reserved for a "Restorer's Corner" column and a space to show off readers' collections in future issues.

The magazine is a example of fine publication design, printed on paper tinted to appear slightly yellowed with age. *Color* reprints of vintage radio ads, chosen for visual appeal, contribute to the theme of antiquity. A charming cartoon figure, Valvolino ("Lil' Tube" is close) introduces features here and there.


Valvolino(R)

This first issue has some getting-started pains, of course. There's a problem with the translations: going from normal Italian to English is one thing, but it is quite a different matter to translate archaic technical Italian to semi-archaic technical English - with the problem of American-vs.-British English to boot. The want ads need to be translated too. It's OK to present the Majorana story of high-power microphones, but better to point out that such heroics were a technological dead end - radio telephony became practical only after the advent of amplifiers.

On balance, this is a charming publication, a considerable pleasure to examine. The subscription rate is 75,000 lire (about $52) per six issues, from Mose' Edizioni, Via Bosco, 4 - 31010 Maser (TV), Italy, telephone/fax 0423-529049. - **LAS**

LOS ANGELES RADIO MANUFACTURERS: 1922-1942

By Floyd Paul, 48 pages, second ed., soft cover, illustrated, $6.75 + $1.25 shipping, from the author at 1545 Raymond Ave. Glendale, CA 91201.

As an Easterner, I wasn't exactly excited by this title . . . but hold on, it is a book you will read from cover to cover. After much research, Floyd documents the history of every radio manufacturer in the LA area and lists the receivers they made. Well summarized, good reference and easy reading for the radio historian and collector. - **BK**

EXPORT AUDIO LIST - 1993

This a 50-page catalog of audio gear, heavily oriented toward British tube equipment, from the Vintage Wireless Company Ltd., Tudor House, Cossham St., Mangotsfield, Bristol BS17 3EN,

England (tel. 0272 565472; fax 0272 575442). It lists books, capacitors (new and old), cartridges and arms, and turntables (remember Collaro? Garrard? Goldring?). There is a fine variety of Leak amplifiers, tuners, and literature on same; likewise with Quad and Radford. New springs are listed for wind-up phonos. There is a wide variety of new power and output transformers for tube amps. Tube sockets are offered in U. S., British, and European styles - even the "9-pin loktal" style for the EF50. There is also a kit for a tube stereo amplifier, 95 watts per channel, at £575. Tubes are not listed - *those* are in the company's Valve Catalogue (*OTB*, Feb. 1992, p. 56). This is engrossing reading, and there's good stuff in it for the foreign-gear enthusiast. The company is set up for foreign sales, accepting a variety of credit cards. - **LAS**

BAMPTON BOOKS CATALOG #12

A review of the latest sales catalog of rare books (60 pages) finds numerous additions covering wireless, early electricity, telegraphy and related subjects - a goldmine of information summarizing books of the past. Prices range from $10 to $265 (for an 1884 first edition of Prescott's Electric Speaking Telephone). $1, from New Wireless Pioneers, Box 398, Elma, NY 14059. - **BK**

ZENITH RADIO LOCATOR INDEX - 1920-1968 - "WHERE TO LOCATE INFORMATION AND PHOTO"

By Richard C. Stamer, 3rd Ed., 100 pp., 8½" x 11", $14.95 ppd from Sound Remedy, 331 Virginia Ave., Collingswood, NJ 08108, (609) 869-0238.

This listing of 1500+ Zenith receivers gives the model year, general style, and the present-day book in which a photo and/or other information can be found. It indexes 26 publications, from the classic Flick of the Switch to Evolution of the Radio, having Zenith information. Separate sections cover cathedrals, auto/boat sets, portables (Trans-Oceanic and "Royal" included), consoles, etc. The information is also sorted by decade. The product codes - on which model numbers are based - are included to allow direct decryption of number of tubes, power source, etc. This is a handy source for the Zenith enthusiast. - **LAS**

BRITISH RADIO AND TELEVISION PIONEERS - A PATENT BIBLIOGRAPHY

By David Krauter, 217 pages, ISBN 0-8108-2716-6, $27.50, from Scarecrow Press, P. O. Box 4167, Metuchen, NJ 08840.

The author cites each of the British patents of 29 radio and television inventors in chronological order, giving a sense of historical development of the inventor's work. The book cites over 1100 British patents issued to John Baird, Alexander Bell, William Crookes, William Eccles, John Fleming, Charles Franklin, Oliver Heaviside, David Hughes, Oliver Lodge, Guglielmo Marconi, Stanley Mullard, William Preece, Henry Round, John Scott-Taggart, William Thomson, Charles Wheatstone and others. A valuable source of information for the radio historian. - **BK**

HEATH NOSTALGIA

By Terry Perdue, K8TP, 124 pages, 5 " x 8" softcover format, $9.95, from Antique Electronic Supply (address below).

There was a lot of reminiscing in the press last year when the Heath Company announced that it was, in effect, out of the kit business. The nature and economics of the electronic industry had changed such that kitmaking for home construction had faded as a business proposition.

This little book is a quasi-history of Heathkit, from its start as a source of airplane kits and parts, via a simple 'scope kit using-up war-surplus radar CRTs, to its peak as the world's largest (and best?) kit maker . . . and the eventual decline. It presents anecdotes from a group of former Heath employees with stories and photos of company life. It hints that, if the series of outside firms that acquired Heath had not treated it as a "cash cow," the firm might have lasted longer in the kit market. It does not claim to be comprehensive, nor researched from company archives - it fails to mention Heath's English operations, for example - but is enjoyable and informative to us of the "kit-building" generation. - **LAS**

1994 WHOLESALE CATALOG - SUPPLIES, BOOKS, TUBES, PARTS

The yearly "Tempe catalog" is out, from Antique Electronic Supply, PO Box 27468, Tempe, AZ 85285-7468, (602) 820-5411. Its 32 pages list 3000+ tube types, plus specialty items like blue-glass 6CA7s and Russian-made audio tetrodes. (Or, if you need an FG-105 thyratron for a spot welder, that can be arranged.) Among new items this year are a kit for a two-tube AM-SW receiver with spider-web coils, T-shirts, and more books. There are parts (2.5-volt power transformers included), B-batteries (!), crystal sets, knobs, restoration supplies and chemicals, grille cloth, and seven pages of books. This is *the* basic catalog for the radio collector-historian. - **LAS**

BVWS BULLETIN (Aug. 10, No. 3) has a short article titled "BUYERS BEWARE." The author believes that with the increasing value of vintage equipment, there is a definite increase in radio theft in Great Britain. He cites several recent examples such as the theft of a Baird Televisor, a choice BBC ribbon mike, and a rare receiver from a London museum. Items never recovered in the past include a very early Marconi receiver from a private museum and a wartime "Enigma" crypto machine. The "beware" message: stolen goods can be reclaimed by the victim. - **BK**

THE MUSEUM

AWA ELECTRONIC COMMUNICATION MUSEUM

Location: Village Green, NY 5 & US 20, Bloomfield, New York
Hours: May 1 through October 31: Sunday, 2-5 PM; also, June 1 - August 31: Saturday, 2-4 PM and Wednesday, 7-9 PM. (Closed Holidays)
Group tours: by appointment
Museum telephone: 716-657-6260
Amateur Station: W2AN
Mailing Address: Bruce Kelley, Curator, 59 Main St., Bloomfield, NY 14469
FREE ADMISSION

AWA MILITARY COLLECTION

Members of the Annex Committee have completed an inventory of the Museum's military equipment. The large collection represents pieces from the Naval Research Lab (NRL), Washington Navy Yard, and private donations. Most are of WW II vintage, although many date from the early '20s with SE-numbers. There is, for example, a development prototype of the Navy RO receiver of 1930. The collection is housed on 40 feet of heavy shelving reaching to the 10-foot ceiling. Much credit for this endeavor goes to Annex Manager Mani Pires with help from Jack Wenrich and Ludwell Sibley doing the accessioning plus several strong hands lifting 80-pound sets.

Dr. Tom Ely is continuing the task of sorting an endless collection of books and magazines, making duplicates available for future sale. Mike Csontos reports a good supply of tubes in the loft which will ultimately be catalogued for restoration purposes. Mike is also in charge of motion-picture material and recordings. His latest challenge is the restoration of a 1914 Powers floor-model 35-mm motion-picture projector. More on this later.

The Museum Committee wishes to thank the many donors for their generous gifts. In addition, a big thanks to those who unselfishly gave time as guides this past season. Another successful year, with attendance from around the world.

NEW GEAR IN MUSEUM

Gerald Byrnes; Syd Chiswell, W2ICZ; Mike Csontos; Sanford Danziger; John Donghia; Bro. Patrick Dowd, W2GK; F. F. Greetham, K2KK; O. T. Hinton; Charles Lee; Carl Maylott, W2YE (SK); Bob McGraw, W2LYH; Alex McKenzie, W1BPI; Charles Meyer; Tony Prasil; Lee Robartes, W2EHA (SK); Walter Smartt; Norvell Wood. Cash donation in memory of Francis Rogers, Larry Cannon); of Arthur Kelly, Peg Hainey.

RADIO STAMPS

Several members have written indicating an interest in collecting communication stamps. The AWA Museum has a large display mounted in glass frames - a gift from Vic Clark, W4KFC. The August 1993 *IEEE Spectrum* devotes several pages to communication stamps with exceptional color reproduction. Likewise, the May-June 1993 issue (No. 90) of the German *Funk Geschichte*. Either is a great reference.

THE YETMAN TRANSMITTER

The machine in the photographs, looking like an ordinary 1908 typewriter, is in reality a Yetman Transmitter: a typewriter that sends American

Yetman Typewriter-Transmitter Company

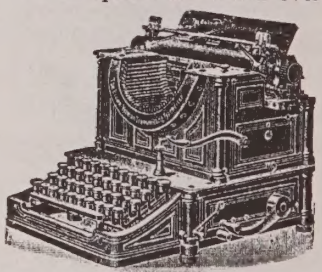
The Best and Most Durable Visible Typewriter Built

Send for –Catalog– "'Twill be worth while"

The Only Key-board Transmitter Producing Absolutely Perfect Morse Code.

The World's Standard

"It Speaks the World Over"



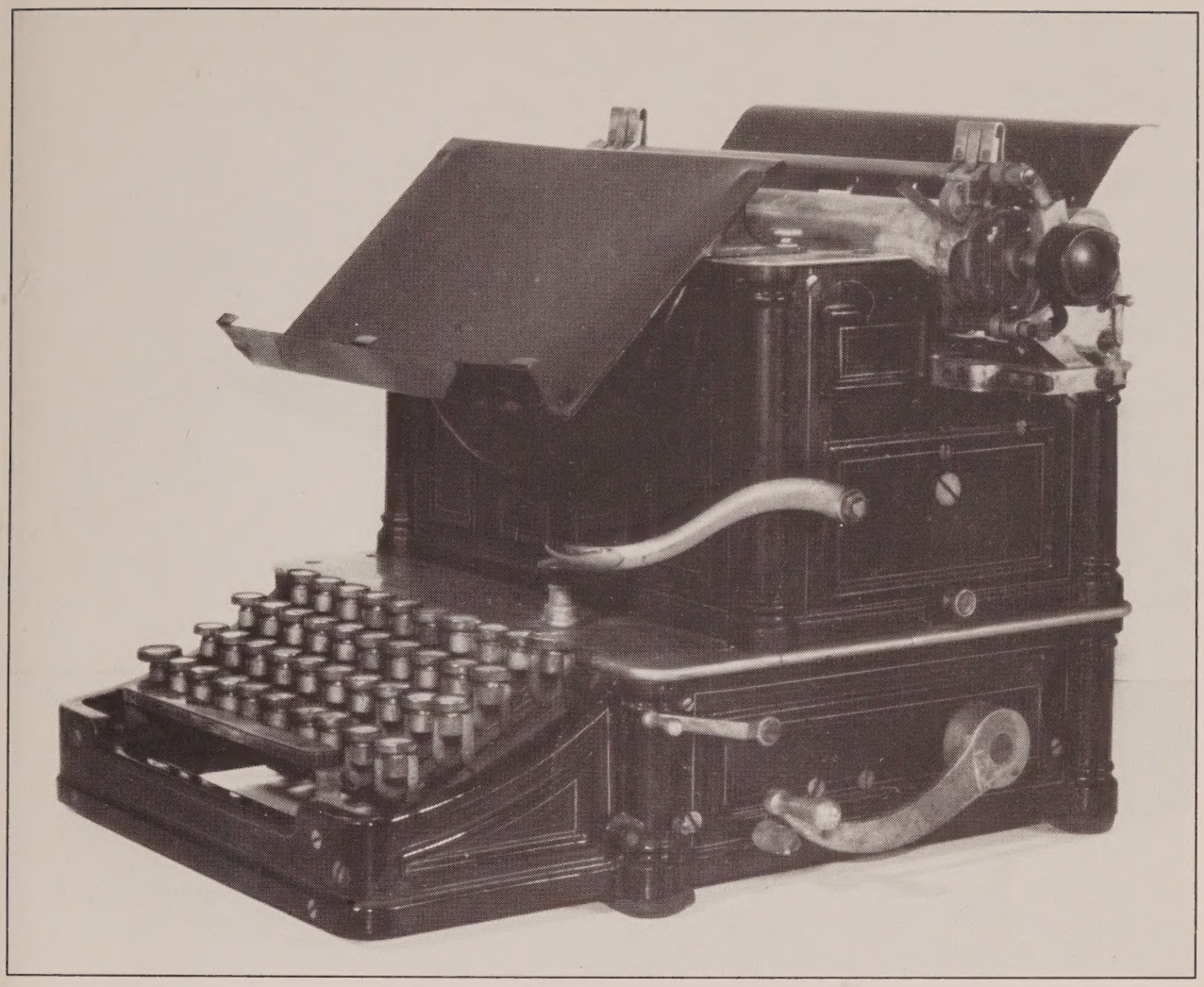
Typewriter-Transmitter

Expert Senders get Expert Salaries. Expert Positions are To-day far more numerous than Expert Senders.

We invite Correspondence from Operators who desire to Represent us in Their Vicinity

You can be an Expert Sender and Remain One if you have a Yetman Typewriter-Transmitter.

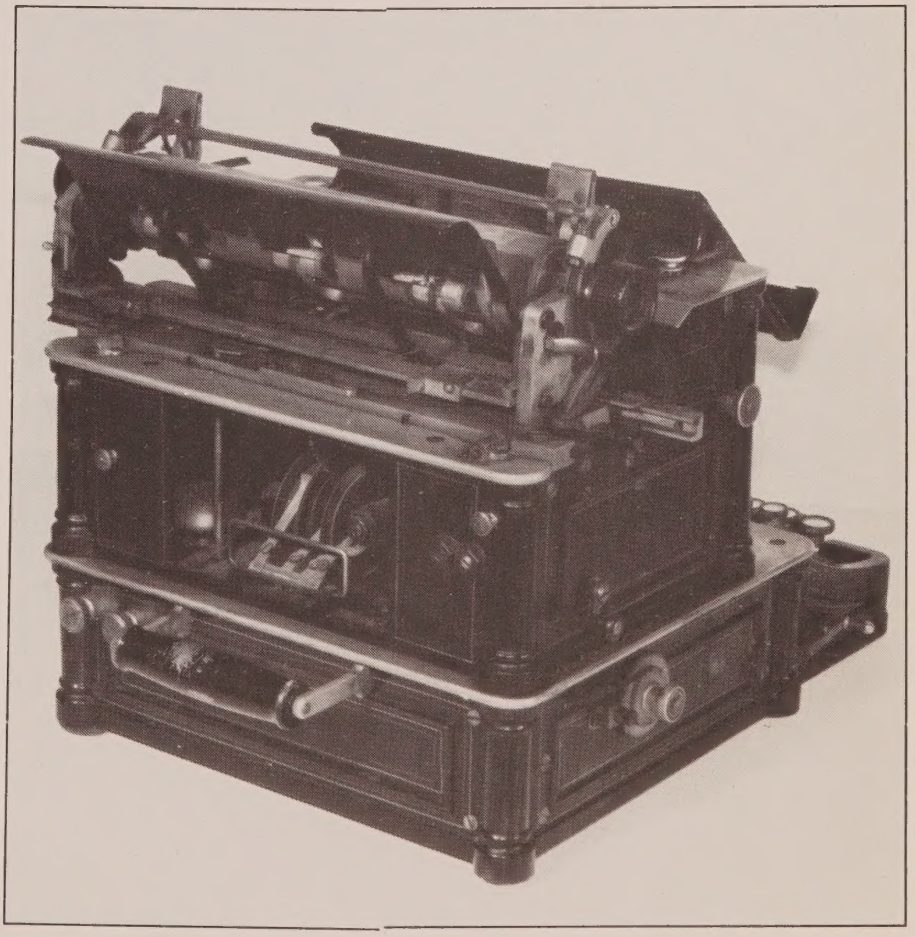
20-24 Vesey Street, New York, N. Y.



Morse signals (note the binding posts on the lower left rear). It recently came to the AWA Museum from a long-closed station of the DL&W Railroad.

Described in the "Key & Telegraph" column in the Oct. 1990 *OTB* (Vol. 31 No. 3, p. 37), it eliminated the need for the user to be a trained Morse sender - but did not address the usual need for the operator to be able to receive Morse as well. At least it made a verbatim copy of what went out on the wire.

The advertisement is from the January 1, 1908 issue of *Telegraph Age* (source: Roger Reinke). As far as is known, the Ford Museum at Dearborn, MI and a private collection have the only other surviving examples.



JUST PIX

In principle, the flea market at Rochester isn't the only purpose of the event, but it certainly holds a place in the hearts, minds, and cash budgets of the participants.

Photo: Richard Ransley

An endearing collectible these days is the "germanium radio": a '50s-'60s crystal set based on the 1N34 and similar diodes. This one is the "Crown GR-10" from the Musen Denki Company Ltd. of Osaka.

Photo: Henry Cohen

A long-time favorite display in the AWA Museum is the Twenties Radio Store, with classic material from the Radio Craze exhibited for the vicarious "radio fan."

Photo: Bruce Kelley